Vol. XV APRIL, 1931 No. 2

# *The Journal of* APPLIED PSYCHOLOGY

JAMES P. PORTER, EDITOR
Ohio University, Athens, Ohio
WITH A BOARD OF CO-OPERATING EDITORS

## TABLE OF CONTENTS

C. H. Griffitts. A Study of Some "Motor Ability" Tests..... 109
Hulsey Cason. General Curves and Conditions of Feeling..... 126
Rudolf Pintner. Intelligence and Month of Birth..... 149
H. H. Remmers. Typical Points of View on Learning Presented to Beginning Students of Education..... 155
Herbert A. Carroll. The Effect of Intelligence upon Phonetic Generalization..... 168
Elma Olson. A Study of the Emotions in Psychopathic Personalities Based on the Pressey X-O Tests, Form B..... 182
Alice M. Leahy. Punching Psychological and Sociological Data on Hollerith Cards..... 199
Nancy Castleman, Margaret Grover and Herbert Moore. An Aptitude Test for High School Teachers..... 208
Edward B. Greene. Effectiveness of Various Rates of Silent Reading of College Students..... 214
Notes and News..... 228
Book Reviews..... 231
New Books and Pamphlets..... 238

PUBLISHED BI-MONTHLY BY THE EDITOR
All communications should be addressed to the Editor,
Ohio University, Athens, Ohio

Printed by
WAVERLY PRESS, INC.
Baltimore, Md.

Entered as second class matter June 3, 1924, at the post office at Baltimore, Maryland, under the act of March 3, 1879.
Acceptance for mailing at special rate of postage provided for in section 1103, act of October 3, 1917. Authorized December 21, 1922.

Copyright 1931, by James P. Porter

# The Journal of Applied Psychology


## CO-OPERATING EDITORS

W. F. Book, Indiana University; W. V. Bingham, Personnel Research Federation, New York; June E. Downey, University of Wyoming; Robert H. Gault, Northwestern University; William Healy, Baker Foundation, Juvenile Court, Boston; H. L. Hollingworth, Columbia University; Joseph Jastrow, University of Wisconsin; Herbert S. Langfeld, Princeton University; James H. Leuba, Bryn Mawr College; Henry C. McComas, Princeton University; Walter D. Scott, Northwestern University; C. E. Seashore, University of Iowa; Daniel Starch, Boston, Mass.; Edward K. Strong, Jr., Leland Stanford Jr. University; L. M. Terman, Leland Stanford Jr. University; E. L. Thorndike, Columbia University; J. E. Wallace Wallin, Department of Education, Baltimore, Md.; G. M. Whipple, Danvers, Mass.; Helen Thompson Woolley, Teachers College, Columbia University.


The scope of The Journal of Applied Psychology will include the following: (a) The application of psychology to vocational activities, such as law, art, public speaking, industrial and commercial work, and problems of business appeals. (b) Studies of individual mentalities, such as types of character, special talents, genius, and individual differences, including the problems of mental diagnosis and vocational prognosis. (c) The influence of general environment conditions, such as climate, weather, humidity, temperature; also such conditions as nutrition, fatigue, etc. (d) The psychology of everyday activities, such as reading, writing, speaking, singing, playing games or playing musical instruments, sports, etc.

Communications, manuscripts, reviews, summaries, notices, books and off-prints for review should be addressed to Dr. James P. Porter, Ohio University, Athens, Ohio. Contributors are requested to follow the conventional method of citation employed by this Journal; in every case the year, volume and pages should be specified.


The Journal of Applied Psychology is published bi-monthly. The subscription price is $5.00 a year. Single numbers $1.00. Remittances and business communications should be addressed to the Editor, James P. Porter, Ohio University, Athens, Ohio.

# A STUDY OF SOME "MOTOR ABILITY" TESTS

C. H. GRIFFITTS

*University of Michigan*

For several years there has been a considerable demand for an adequate test or battery of tests of so-called "motor ability." The writer frequently has been asked for such a test by those who have assumed that psychologists could furnish them with such a test. When we receive a request of this nature we can of course think of a variety of tests that have been proposed and sometimes used to some extent. But the main difficulty has been that we have had too little information about the tests. We have not known whether the ability represented by the scores in any one of these tests is "general" or whether it is "specific" to the particular test situation. We have not known to what degree these tests are measuring the same ability or group of abilities, and too frequently it has been impossible to find any information as to the number of trials that is necessary to obtain a score with a satisfactory reliability.

In an effort to obtain at least some information bearing on these and other problems, I arranged for three men, E. C. Roberts, H. F. Yelland, and H. E. Stricker, to give a group of tests twice to each of a group of men. We had hoped to get data from one hundred men but at the close of the school year we had complete data for but sixty. Most of these men were sophomores, members of a beginning class in psychology. Ordinarily the two test-periods were one week apart, and at the same time of day. The three men who gave most of the tests had had previous training and an attempt was made to reduce the influence of any "personal equations" to a minimum.

## THE TESTS

The subjects were first called together in small groups and given the MacQuarrie (4) Test of Mechanical Ability, and this was

repeated a week later. Only the first three parts of this test were used in this study, and scores for the right hand only were obtained. The other nine tests were all given individually, and for both right and left hands or arms. Only the experimenter and the subject were in the room at the time the individual tests were being given. A brief description of the tests and test-procedures follows.

M-1. MacQuarrie's Tracing Test. The subject has to draw a line through small breaks in a series of vertical lines. The score is the number of gaps through which the subject draws the line without touching the printed lines.

M-2. MacQuarrie's Tapping Tests. The subject puts three dots in each of a succession of circles. The score is the number of circles with three dots in them.

M-3. MacQuarrie's Dotting Test. The subject puts one dot in each of a series of small circles which are connected by a continuous line, and are at varying distances apart. The score is the number of circles with dots in them which do not touch the circles.

I. Free Tapping. The subject tapped a metal plate with a metal stylus as rapidly as possible. A switch and an electric counter were in series with the plate and stylus. In this and in other tests using the metal stylus, the connection with the stylus was by a small, partially coiled, and very flexible wire which came down from a point 4 feet above, about 6 inches in front, and a few inches to one side of the metal plate. The subject, as in all of the tests with the exceptions of the MacQuarrie and the Strength tests, sat on a stool 24 inches high, at tables 33½ inches high. The experimenter closed the switch, told *S* to begin, and started a stop-watch with *S*'s first tap. At the close of a ten second period, *E* opened the switch and told *S* to stop. *S* was given four trials each day with each hand, in the order: R L L R L R R L. About fifteen seconds were allowed between trials. The number of taps at each trial was recorded, but the score for the day, for each hand, was the total number of taps in the four ten-second periods. A similar procedure was followed in the scoring with the other tests.

II. Back-and-forth Dotting. Cross-ruled paper, six lines to the inch each way, was used. Toward the left side of the sheet an area ten spaces wide was ruled off from a point about 1 inch from the top of the sheet to the bottom. Twenty spaces to the right a similar area was ruled off. The subject had first to put a dot in the first square in the first row in the first area, then a dot in the first square in the first row in the second area, then a dot in the second square in the first row in the first area, then the same in the second area, etc., back and forth. From the first row he went to the second, then to the third, etc., down the page until time was called at the close of a thirty-second period. The score for each trial was the number of dots correctly placed and not touching any of the lines. There were four trials with each hand, in the same order as in the preceding test.

III. Matchboard Test. This is an adaptation of Kemble's (3) test. Nineteen rows of small holes were drilled in a hardwood block. There are ten holes, $\frac{3}{8}$-inch apart, in each row, and the rows are $\frac{1}{2}$ inch apart. The holes were drilled with a No. 20 drill. At the start of a test the first six rows in the far end of the block were filled with matches. *S* was to move these matches as rapidly as possible to the other end of the block (the near end) *S* was required to move the matches one at a time, in regular order, filling the first row, then the second, etc., until time was called at the end of a sixty-second period. He worked from the right end of each row with the right hand and from the left end of a row with the left hand. There were four trials each day with each hand, in the same order as in the preceding tests. The score was the number of matches moved.

IV. Steadiness Test. This is Test 13 in Whipple's Manual (7). We used the metal plate and stylus formerly made by the Stoelting Company, but not identical with the one they now supply. This plate is placed at an angle of forty-five degrees back of vertical, and has a series of nine holes, graded in size. We placed it in front of the shoulder of the arm being tested and about 4 inches from the edge of the table. *S* was required

to hold the stylus in each hole for fifteen seconds, trying not to touch the metal plate. Ten-second periods were allowed between holes. The metal plate and stylus were in series with an electric counter which recorded the number of contacts in each hole and made enough sound to warn *S* when the stylus touched the plate. *S* went from one hole to the next until fifteen or more contacts had been made. The Holsopple (2) method of scoring was used, which is based on the number of the hole in which the fifteenth contact is made. There were two trials with each hand each day, a "trial" being once through the series of holes until fifteen or more contacts had been made.

V. Aiming, at holes. The same apparatus was used as in the preceding test. A metronome was set at sixty. At the count of one, *S* was to insert the stylus in the first hole, and at the count of two to withdraw it and let his hand drop to the table in front of the plate. At the count of three he inserted the stylus in the second hole, etc. One "aim" at each of the holes in the series constituted one trial. *S* was given six trials with each hand each day. The score for each trial was the number of holes in which *S* succeeded in inserting and removing the stylus without touching the plate.

VI. Aiming, at crosses. This, with some modification, is Test 11 in Whipple's Manual. The sheet of paper with the ten crosses arranged in irregular order, was tacked at shoulder-height on the wall. *S* stood arm-length from the paper, with the paper directly in front of the shoulder of the arm being tested. A metronome was set at 66. At the count of one *S* was to strike with his pencil at the intersection of the first cross, and at the next beat to swing the arm down to a vertical position at his side. At the third beat he aimed at the intersection of the second cross, etc. After aiming once, in order, at each of the ten crosses, *S* was required to repeat, without interruption, beginning again with the first cross. For convenience we called this one trial, which would be twenty "aims." *S* was given two such trials with each hand each day. The score for each trial was the average distance, in millimeters, by which *S* missed the intersection of the lines.

VII. Groove Test. This is Test 12 in Whipple's Manual. The "groove" we used is one formerly made by Stoelting, and was used in but one position. The narrow end of the groove was placed toward *S*, and the wide end away from him. The block on which the groove is mounted was placed at the edge of the table, and directly in front of the shoulder of the arm being tested. *S* was required to place the metal stylus in the wide end of the groove and move it toward the narrow end as far as he could without touching either of the sides. He was told to move the stylus at a speed that would take the stylus from one end of the groove to the other in about eight seconds, and this speed was demonstrated by *E* before the test began. The electric counter in series with the stylus and the metal sides of the groove gave an audible signal whenever the side was touched As in all of these tests, *S* was required to use a free-arm movement. Twenty trials were given with each hand each day, in the order 10R, 10L, 10L, 10R. A short rest was given after each ten trials, and there was an interval of about ten seconds between trials. The score at each trial was the distance the stylus traveled before touching a side.

VIII. Scales Test. So far as I know, this test has never before been described. Two household scales were fastened to a wide board, eleven inches apart (from center to center of platforms). As *S* faced them, he could see the dial of the scale at his left, but the scale at his right was turned so *S* could not see the dial but so *E* could. First *S* was told to push down on the scale-platform at his left with his left hand until the pointer stood at one-half pound, and at the same time to try to push down with equal pressure on the other scale with his other hand. This procedure was repeated with 1, 2, 3, 4, 6, 8, and 10 pounds. This meant eight different pressures at what we called one trial. Four such trials were given each day. The score used in this report is the sum of the errors, in pounds. Because this test involves the simultaneous use of both arms in the way it does, there are no separate scores for the right and left sides. For convenience, the data obtained with this test are included in the "Right-hand" columns. I may have more to say about this test and about methods of scoring at a later time.

IX. Strength. The strength of grip was measured with an oval dinamometer made by Zimmermann (Berlin). Five trials were given, alternately, to each hand each day. The strength of the fore-arm flexors and fore-arm extensors was measured according to the Martin-Rich (5) procedure, three trials with each arm each day. The three averages (for grip, flexors, and extensors) for each side of the body were totaled to obtain the score for the side and day.

In making the original detailed tables upon which this report is based, the scores for the left hand or arm of left-handed subjects were recorded in the "Right-hand" column, and the scores for the right hand in the "Left-hand" column. Because there were only five left-handed subjects, the part of this report dealing with dextrality indices will be based on the data for the right-handed subjects only.

Age was recorded for each subject, and weight, height, and hands were measured, but a report dealing with these data will be made later.

## COEFFICIENTS OF RELIABILITY

Coefficients of reliability for each test and for each side, where we had separate scores for each side, are shown in table 1. These coefficients were computed between the first and second day's scores with each test. Then, because all of our inter-test correlations were computed from the combined scores of both days, we used the Spearman-Brown (1) formula to determine the *probable* reliability of these combined scores. From the data given, it will be possible for any one who so desires to use this same formula to secure an estimate of the probable number of trials with any test to secure any desired reliability.

## MEANS AND STANDARD DEVIATIONS

The means and standard deviations for each test, each hand, and each day are shown in table 2. It will be noticed that these values in the table represent, for each test, the *total* score for any given hand and day, and not the average of the several trials each day. By referring to the description of the tests the

TABLE 1

*Coefficients of reliability*

| TEST | CORRELATION BETWEEN FIRST AND SECOND DAY'S WORK | | PROBABLE RELIABILITY OF SCORES BASED ON BOTH DAYS' WORK | |
|---|---|---|---|---|
| | Right | Left | Right | Left |
| M-1 | .57 | | .73 | |
| M-2 | .84 | | .91 | |
| M-3 | .71 | | .83 | |
| I | .77 | .75 | .87 | .86 |
| II | .81 | .82 | .90 | .90 |
| III | .72 | .81 | .84 | .90 |
| IV | .71 | .71 | .83 | .83 |
| V | .69 | .65 | .82 | .79 |
| VI | .83 | .74 | .91 | .85 |
| VII | .72 | .65 | .84 | .79 |
| VIII | .72 | | .84 | |
| IX | .95 | .86 | .97 | .93 |

TABLE 2

| TEST | MEANS | | | | STANDARD DEVIATIONS | | | |
|---|---|---|---|---|---|---|---|---|
| | Right hand | | Left hand | | Right hand | | Left hand | |
| | First day | Second day | First day | Second day | First day | Second day | First day | Second day |
| M-1 | 35.9 | 41.1 | | | 7.19 | 7.55 | | |
| M-2 | 42.7 | 44.6 | | | 7.47 | 7.64 | | |
| M-3 | 19.2 | 20.1 | | | 3.00 | 3.42 | | |
| I | 292.3 | 294.3 | 265.8 | 265.3 | 34.90 | 34.90 | 28.50 | 32.13 |
| II | 274.3 | 300.8 | 236.3 | 257.6 | 42.80 | 45.33 | 36.65 | 43.08 |
| III | 86.9 | 96.3 | 75.0 | 80.7 | 10.72 | 10.33 | 9.58 | 9.04 |
| IV | 14.7 | 14.9 | 13.9 | 14.0 | 1.32 | 1.44 | 1.55 | 1.51 |
| V | 42.1 | 41.9 | 35.7 | 37.0 | 7.61 | 7.75 | 7.94 | 7.67 |
| VI | 112.4 | 106.5 | 132.7 | 131.3 | 42.20 | 42.08 | 46.98 | 47.88 |
| VII | 168.1 | 172.4 | 135.0 | 140.8 | 52.15 | 51.85 | 43.80 | 44.95 |
| VIII | 31.0 | 28.1 | | | 15.28 | 14.97 | | |
| IX | 250.2 | 249.0 | 231.8 | 231.5 | 35.04 | 35.08 | 33.56 | 37.68 |

mean score per trial may be computed. However, such averages per trial must be used with caution, because the average score per trial for four trials is likely not to be the same as the average per trial for a larger or smaller number of trials. Our procedure does not affect the coefficients of correlation.

In all discussions of these tests it must be remembered that the scores of Tests VI and VIII are "error" scores, and that the larger the numerical value, the poorer the score. The signs of the coefficients of correlation between each of these tests and the other tests were changed before recording them in the tables.

Those who may be interested in comparing the work on the two days should turn to tables 5 and 6, as well as table 2. The gains shown in table 5 were obtained from the group-averages given in table 2, and not by determining the gain for each individual in each test and then averaging these individual gains. The individual method may have been somewhat better but probably not enough so to justify the extra labor involved. Table 5 shows that there is a tendency toward greater gains, both absolute and relative, in the right-hand scores than in the left-hand scores. This tendency is most pronounced in the results of Tests III and VI. However, the probable error of the difference with some of the tests is high, and the gains are greater in the left-hand scores of Tests V and VII, and the loss slightly greater in the right-hand scores of Test IX.

### INTER-TEST CORRELATIONS

The inter-test correlations between right-hand scores are shown in table 3, and those between left-hand scores are shown in table 4. In computing these coefficients the combined scores of the work of both days were used. For the right side (table 3) it may be noticed that Test III (Matchboard) shows the highest average correlation with all of the other tests. If we consider only the "individual" tests (Tests I–IX) we find that Test IV (steadiness) shows the highest average correlation with the other tests on account of its relatively high correlation with Test V (aiming at holes). The similarity of the results for the two sides should be noticed.

The lowest correlations are those in which Tests I (Free Tapping), VIII (Scales Test), and IX (Strength) are involved.

TABLE 3

*Inter-test correlations. Right hand. Decimal points omitted*

| TEST | M1 | M2 | M3 | I | II | III | IV | V | VI | VII | VIII | IX |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M-1 | | 56 | 49 | 10 | 37 | 45 | 31 | 39 | 15 | 39 | 02 | 12 |
| M-2 | 56 | | 45 | 05 | 50 | 44 | 22 | 26 | 13 | 32 | −13 | −05 |
| M-3 | 49 | 45 | | 16 | 60 | 67 | 32 | 37 | 11 | 38 | 10 | 04 |
| I | 10 | 05 | 16 | | 06 | 23 | 04 | −04 | 00 | −03 | −08 | 02 |
| II | 37 | 50 | 60 | 06 | | 54 | 40 | 25 | 14 | 41 | −05 | −12 |
| III | 45 | 44 | 67 | 23 | 54 | | 48 | 36 | 30 | 56 | −03 | −18 |
| IV | 31 | 22 | 32 | 04 | 40 | 48 | | 64 | 39 | 54 | 18 | −04 |
| V | 39 | 26 | 37 | −04 | 25 | 36 | 64 | | 44 | 53 | 11 | 21 |
| VI | 15 | 13 | 11 | 00 | 14 | 30 | 39 | 44 | | 27 | −06 | 01 |
| VII | 39 | 32 | 38 | −03 | 41 | 56 | 54 | 53 | 27 | | −05 | −12 |
| VIII | 02 | −13 | 10 | −08 | −05 | −03 | 18 | 11 | −06 | −05 | | 28 |
| IX | 12 | −05 | 04 | 02 | −12 | −18 | −04 | 21 | 01 | −12 | 28 | |
| Mean..... | 30 | 25 | 34 | 05 | 28 | 35 | 32 | 33 | 17 | 29 | 03 | 02 |
| Mean I–IX. | | | | 03 | 20 | 28 | 33 | 31 | 19 | 27 | 04 | 01 |

TABLE 4

*Inter-test correlations. Left hand. Decimal points omitted*

| TEST | I | II | III | IV | V | VI | VII | VIII | IX |
|---|---|---|---|---|---|---|---|---|---|
| I | | 35 | 31 | 20 | 04 | −02 | 10 | −08 | 17 |
| II | 35 | | 54 | 34 | 17 | 12 | 25 | −07 | 03 |
| III | 31 | 54 | | 48 | 33 | 06 | 29 | 06 | 08 |
| IV | 20 | 34 | 48 | | 57 | 34 | 68 | 05 | −01 |
| V | 04 | 17 | 33 | 57 | | 47 | 52 | 12 | 22 |
| VI | −02 | 12 | 06 | 34 | 47 | | 34 | −11 | 15 |
| VII | 10 | 25 | 29 | 68 | 52 | 34 | | −11 | 02 |
| VIII | −08 | −07 | 06 | 05 | 12 | −11 | −11 | | 31 |
| IX | 17 | 03 | 08 | −01 | 22 | 15 | 02 | 31 | |
| Mean... | 13 | 22 | 27 | 33 | 31 | 17 | 26 | 02 | 11 |

Test VIII shows the highest correlation with Test IX, and Test IX shows the highest correlation with Test VIII. This corre-

lation (.28) has a probable error of .08. MacQuarrie says that Test M-2 is a substitute for Test I, yet the correlation between these tests is only .05. Of course it is possible that in some work Test M-2 is more valuable than Test I. But however that may be, it is worth while to notice the great difference in scores resulting from what might appear to be a slight change in procedure.

In any situation where a battery of tests of unrelated abilities (or ability-groups) is desired, it is evident that Tests I, VIII, and IX should receive consideration.

TABLE 5

*Test VIII was omitted in computation of the means*

| TEST | GAINS: FROM GROUP MEANS | | | | CORRELATIONS BETWEEN R AND L SIDES | | DEXTRALITY INDICES N = 54 | |
|---|---|---|---|---|---|---|---|---|
| | In mean scores | | As per cents | | | | | |
| | Right | Left | Right | Left | First day | Second day | First day | Second day |
| I | 2.0 | −.5 | .7 | −.2 | .75 | .70 | 1.09 | 1.12 |
| II | 26.5 | 21.3 | 9.7 | 9.0 | .84 | .88 | 1.16 | 1.17 |
| III | 9.4 | 5.7 | 10.8 | 7.6 | .57 | .49 | 1.17 | 1.20 |
| IV | .2 | .1 | 1.4 | .7 | .71 | .82 | 1.06 | 1.06 |
| V | −.2 | 1.3 | −.5 | 3.6 | .66 | .78 | 1.20 | 1.15 |
| VI | 5.9 | 1.4 | 5.2 | 1.1 | .79 | .80 | 1.23 | 1.29 |
| VII | 4.3 | 5.8 | 2.6 | 4.3 | .53 | .57 | 1.03 | 1.20 |
| VIII | 2.9 | | 9.3 | | | | | |
| IX | −1.2 | −.3 | −.5 | −.1 | .85 | .91 | 1.09 | 1.09 |
| Mean.. | 5.9 | 4.4 | 3.7 | 3.3 | .71 | .74 | 1.13 | 1.16 |

The inter-test correlations between Tests IV, V, and VII should also be noticed. Test IV correlates higher with Tests V and VII than with any other tests, and Test V correlates higher with Tests IV and VII than with any other test, and these statements are true for both hands. Also, in table 4, it may be seen that Test VII shows higher correlations with Tests IV and V than with any other test, and in table 3 Test VII shows a higher correlation with but one other test. The fact that a metal stylus was used in each of these tests probably

increased the correlations between them. It is also probable that the relatively high inter-test correlations between the three parts of the MacQuarrie test are influenced by the fact that the same "apparatus" was used in each of these tests, and also by the fact that these three tests were given as group tests. In this connection it should be noticed that in Table 4 the highest correlation, and in table 3 the second highest correlation are the correlations between Tests IV and V. This may at first be rather surprising to some, because Test IV is a "steadiness" test, and because of the tremor factor it is at least more similar to Test VII than to any other test; and because Test V is an "aiming" test, as is Test VI. Yet there is a higher correlation between a "steadiness" test and an "aiming" test than between two "steadiness" tests or two "aiming" tests. This also is probably the result in part at least of the identity of the apparatus set-up in the two tests.

### COMPARISON OF RIGHT AND LEFT SIDES

The correlations between the scores for the right and left sides are shown in table 5. There appears to be a slight tendency toward higher correlations in the results of the second day's work than in those of the first day's work. This difference, if not due solely to chance, is probable due in part to a higher degree of accuracy in the scores after the strangeness of the experimenter and of the test-situation has had a chance to wear off. Tests I and III furnish the exceptions to the rule.

The strength of the left side on the second day shows a higher correlation (.91) with the strength of the right side on the second day than it does with the strength of the left side on the first day (.86, table 1). Several factors may contribute to this result. There is something of a "learning" factor in most if not all of the common tests of strength, quite apart from any increase in the strength of the muscles. This learning factor apparently is greater where the left side is concerned, and in the early stages of "trial and error" learning chance is likely to play a larger part than it does at the later stages. In this connection the correlation (.95) between the first and second day's

results with the right side must be remembered, because it is so high, and because it is considerably higher than the corresponding coefficient (.86) for the left side.

Average dextrality indices for the different tests and different days are also shown in table 5. The values shown here were obtained by computing the dextrality indices separately for each subject and then computing the mean of these individual indices. The average indices shown in the table do not include the indices for the five left-handed subjects, because including them would tend to obscure results. With a left-handed subject an increase in the difference between the scores for the two hands would result in a lower index, while with a right-handed subject such an increase would result in a higher index. In view of this fact the inadvisability of averaging indices of right-handed and left-handed subjects is obvious.

The indices shown in this table show that the difference between the two sides tends to increase rather than decrease with a repetition of the tests. In other words, the right-handed subjects tend to become more right-handed. There is a greater increase for the hand that is used more in every-day life than for the hand that is used less. We have already noticed that there is a somewhat greater gain in scores for the right side than in scores for the left side. If these differences are not due solely to chance, is it possible that they may be regarded as evidence of a transfer of training?

There was a considerable degree of variability in the indices for these fifty-four right-handed subjects. Some are more right-handed than others. The average index for each subject in Tests I-VII were computed. The mean of these averages is 1.152, and the standard deviation is 0.74. Occasionally, especially in Tests V and VII, a right-handed subject made a better score with the left hand than with the right. This may be because they were expecting greater difficulty with the left hand and therefore concentrated their attention more on the task, or it may be possible that tremor was somewhat less in the left hand or arm than in the right.

### COMPARISON OF INITIAL SCORES WITH GAINS

Who makes the greater gain, those with the higher initial scores or those with the lower initial scores? It is a common belief that those with the lower initial scores make smaller absolute gains but greater relative gains than do those with the higher initial scores. We have here the old question of whether practice makes individuals more or less alike. Although there was no extended practice in any of our tests in our work, it was decided to compare the gains of those having the ten highest initial scores with the gains of those having the ten lowest initial scores. By "initial score" we mean the score of the work done the first day, which for every test involved several trials. The gain is the score for the second day less the score for the first day. Due to the fact that sometimes more than one subject makes the same score, a few of the values shown in table 6 are the averages of nine or eleven gains instead of ten. Under *H* in this table are found the average gains of those with the ten highest initial scores, and under *L* the average gains of those with the ten lowest initial scores. The algebraic averages were computed by subtracting the losses from the gains and dividing by *N*, which ordinarily was ten. The arithmetic averages show the average difference between the scores for the two days, irrespective of directions.

Table 6 shows a very definite tendency for the greater gains to be made by those with the lower initial scores. When the averages of the results of all the tests are considered, it may be seen that the net result for those with the higher initial scores is a loss instead of a gain, while there is a net gain of over ten per cent by those with the lower initial scores. But before drawing any final conclusions regarding the influence of practice on individual differences we must consider Thorndike's (6) mathematical demonstration of the influence in such studies of chance or random errors. There is no room here to repeat Thorndike's discussion, except to say that random errors would in themselves tend to produce the result shown in table 6. Whether, with random errors eliminated, the nature of the results would be changed is another question. By comparing

the per cent gains shown in Table 6 with the coefficients of reliability shown in table 1, it may be seen that more than the influence of random errors is involved in the situation, because

TABLE 6

| TEST | MEAN CHANGES IN SCORES | | | | MEAN PER CENT CHANGES | | | |
|---|---|---|---|---|---|---|---|---|
| | Algebraic | | Arithmetic | | Algebraic | | Arithmetic | |
| | H | L | H | L | H | L | H | L |
| **Right hand** | | | | | | | | |
| M-1 | 3.0 | 8.7 | 7.5 | 8.7 | 5.3 | 33.8 | 15.6 | 33.8 |
| M-2 | 1.3 | 3.5 | 2.5 | 3.5 | 2.5 | 10.7 | 4.8 | 13.0 |
| M-3 | .5 | 2.0 | 2.3 | 2.5 | 2.1 | 15.0 | 9.8 | 17.8 |
| I | −7.0 | 16.5 | 21.6 | 17.9 | −2.0 | 6.9 | 6.2 | 7.5 |
| II | 15.1 | 22.0 | 16.7 | 28.4 | 4.3 | 11.4 | 4.8 | 14.3 |
| III | 7.0 | 12.4 | 9.6 | 12.4 | 7.1 | 17.3 | 9.4 | 17.3 |
| IV | .1 | 1.0 | .6 | 1.3 | .9 | 7.9 | 3.2 | 9.9 |
| V | −3.1 | 5.2 | 5.1 | 7.4 | −5.8 | 16.1 | 9.7 | 24.4 |
| VI | −10.8 | 6.5 | 13.8 | 27.5 | −19.0 | 2.9 | 25.2 | 15.2 |
| VII | −18.2 | 26.7 | 30.0 | 28.1 | −7.1 | 30.0 | 12.1 | 31.3 |
| VIII | .1 | 10.1 | 2.3 | 24.1 | −.6 | 8.6 | 16.5 | 39.6 |
| IX | 1.5 | 2.2 | 8.2 | 12.0 | .6 | 1.1 | 2.8 | 5.8 |
| Mean.. | −.9 | 9.7 | 10.0 | 14.5 | −1.0 | 13.5 | 10.0 | 19.2 |
| Mean*. | −1.9 | 11.6 | 13.2 | 16.9 | −2.8 | 11.7 | 9.2 | 15.7 |
| **Left hand** | | | | | | | | |
| I | −10.1 | 7.6 | 17.1 | 12.8 | −2.7 | 3.4 | 5.5 | 5.5 |
| II | 13.1 | 21.7 | 19.7 | 26.3 | 4.3 | 11.4 | 6.4 | 13.7 |
| III | 2.2 | 6.3 | 3.6 | 6.3 | 2.4 | 10.0 | 4.0 | 10.0 |
| IV | −.6 | .7 | .8 | 1.1 | −4.1 | 6.9 | 5.1 | 10.6 |
| V | −1.8 | 3.8 | 3.6 | 5.8 | −3.8 | 18.2 | 7.9 | 25.1 |
| VI | −12.9 | 13.3 | 14.1 | 41.9 | −17.0 | 5.5 | 18.4 | 20.4 |
| VII | −29.1 | 28.9 | 34.6 | 30.3 | −12.5 | 50.0 | 15.4 | 51.5 |
| IX | 6.3 | 2.7 | 8.9 | 12.5 | 2.3 | 1.6 | 3.2 | 6.8 |
| Mean.. | −4.1 | 10.6 | 12.8 | 17.1 | −3.9 | 13.4 | 8.2 | 17.9 |

* In computing these means, Tests M-1, M-2, M-3, and VIII were excluded, so obtain means comparable with those shown for the left hand.

there is but little correlation between the per-cent gains and the coefficients of reliabilty for the different tests. It is probable that some of those with the lowest initial scores did not so quickly become adjusted to the whole test-situation as those with the highest initial scores. In all such work the incentive factor may also influence the results in one way or another. The subjects were all asked to do their best, but otherwise the tests were given in a straight-forward manner without any artificial stimulation to greater effort. However, in the individual tests (Tests I–IX) the subjects seemed to be trying at all times to do their best, and we have no evidence that such was not the case in the group tests, although it is probably true that ordinarily there is a more uniformly high degree of effort in individual tests than in group tests, and in "apparatus" tests than in some other types of tests. The subjects were not given any information regarding their scores until after the work with the whole group had been completed.

Whatever we may think to be the truth regarding the influence of practice on individual differences as a general proposition, it is still quite clearly demonstrated by table 6 that with several of these tests, those with the highest initial scores are likely to make poorer scores a week later, while those with the lowest initial scores are likely to gain as much as fifty per cent (Test VII, left hand). It is also clear that with most of these tests we may expect much greater gains by those with the lowest initial scores than by those with the highest initial scores. Those with the ten lowest initial scores in Test M-1, right hand, showed an average gain of 33.8 per cent, and those with the ten lowest initial scores in Test VII, right hand, showed an average gain of 30.0 per cent. At the same time, it should be noticed that with these same tests there was either a small average gain or an actual loss by those with the ten highest initial scores.

It must not be thought that a negative value for any test in table 6 means that all of the ten individuals with the ten highest initial scores showed a loss rather than a gain in scores. In no case was this true. In every test at least two of the ten with

the highest initial scores showed a gain, and occasionally one or more of those with the lowest initial scores showed a loss instead of a gain.

## SUMMARY

1. Ten tests usually classed as tests of "motor ability," one of kinaesthetic and tactual discrimination, and one of strength, were given twice to each of a group of sixty college men. The first and second sittings were one week apart. Right-hand and left-hand scores were obtained on each of the two days with eight of the twelve tests.

2. Coefficients of reliability, mean scores, standard deviations, inter-test correlations, gains and losses in scores, correlation between right and left sides, and dextrality indices are given for each test.

3. With five of the eight tests with which both right and left-hand scores were obtained, there was a greater gain in the scores for the preferred hand than in the scores for the other hand.

4. The scores in Free Tapping, in the Scales Test, and in the Strength Test, show very little correlation with any of the other tests.

5. Similarity of apparatus and of test-situations tends to increase the inter-test correlations.

6. There is a slightly higher correlation between the scores for the right and left sides in the results for the second day than in the results for the first day.

7. The average dextrality index is slightly greater for the second day's results than for the first day's results. This difference, if not due to chance, means that the right-handed are more right-handed the second day than they are the first.

8. Those with the lowest initial scores show an average gain much greater than the average gain of those with the highest initial scores. This is true of both absolute and relative gains, for both right and left sides, and for most of the test.

## REFERENCES

(1) BROWN, WM.: The Essentials of Mental Measurements, 1911.
(2) HOLSOPPLE, J. Q.: Reliability of scores in steadiness tests. Jour. Exp. Psychol., 5, 1922, 203–214.
(3) KEMBLE, W. F.: Choosing Employees by Test, 1917.
(4) MACQUARRIE, T. W.: A mechanical ability test. Jour. Personnel Res., 5, 1927, 329–337.
(5) MARTIN, E. G., AND RICH, W. H.: Muscular strength and muscular symmetry in human beings. Amer. Jour. Physiol., 47, 1918, 29–43.
(6) THORNDIKE, E. L.: The influence of the chance imperfections of measures upon the relation of initial score to gain or loss. Jour. Exper. Psychol., 7, 1924, 225–232.
(7) WHIPPLE. G. W.: Manual of Mental and Physical Tests, Vol. I, 1914.

# GENERAL CURVES AND CONDITIONS OF FEELING

HULSEY CASON

*University of Wisconsin*

*Introduction.* Several studies have been made of the daily, weekly, and yearly curves of work; and it has been found that mental and motor efficiency varies in different occupations and depends upon a complicated set of conditions. Attempts have likewise been made to measure the pleasant and unpleasant feelings, and the novel opinion has sometimes been expressed that the worker's output is not at all influenced by his emotional condition.

Although the influence of a person's feelings on his output may be small when a strong incentive is used, it seems almost too obvious a fact to require any emphasis that people generally do not work effectively when their feelings are at a low level. When the quantity and quality of the work begin to fall off in a noticeable way, more energy is commonly put into the task in attempting to bring the accomplishment back to its customary level. A reliable positive correlation between feelings of fatigue and a decrease in working efficiency has been found by a large number of investigators under a variety of conditions. When the feelings are decidedly unpleasant, the mental and motor efficiency tends to be low, and in many cases the individual will stop work altogether. Most of the work of the world is not done under the strong incentive that is so frequently present in the formal conditions of the psychological laboratory.

The employer is naturally interested in the worker's output, but there are few things in the world that are more important for the worker himself than the way he feels. A useful psychological principle which may be applied in this connection is that "If the feelings exist, they must amount to something." They must be the result of certain conditions, and the cause of other conditions and activities in the psychological organism.

At the present time an increasing amount of attention is being paid to the feelings and general attitudes of people engaged in all kinds of occupations.

Most of the investigations of variations in efficiency and fatigue have been limited to a special occupation in some factory or school, and only a small number of narrowly selected subjects has generally been studied during a limited portion of the day.[1] In the present study an attempt has been made to obtain a rough measure of pleasant and unpleasant feelings during the different periods of the day, during the week, and during the year. We have employed a wide selection of subjects engaged in a large number of different occupations. Several results are submitted on the daily, weekly, and yearly curves of feelings for the two sexes, for different ages, and for people engaged in various occupations. Some correlations have also been obtained between the feelings, on the one hand, and weather, marital status, formal school education, and sleeping habits, on the other.

*Procedure and subjects.* In March, 1930, some 60 of the writer's students at the University of Rochester,[2] and others, assisted in obtaining subjects for the present investigation. The problem and method were carefully explained to all who assisted in obtaining subjects. The subjects furnished information in regard to (1) their sex, (2) age, (3) marital status, (4) formal school education, (5) occupation, (6) feelings during the different periods of the day, (7) feelings on the different days of the week, (8) feelings during the different months of the year, (9) the influence of the weather on feelings, and (10) sleeping habits. The students who assisted in obtaining subjects were in four classes taught by the writer: an extension course in Applied Psychology, the second semester of a college

[1] Several references to the literature in this field may be found in Max Offner, *Mental fatigue*, 1911 (Tr.); Edouard Claparède, *Experimental pedagogy and the psychology of the child*, 1911 (Tr.); H. M. Vernon, *Industrial fatigue and efficiency*, 1921; and A. T. Poffenberger, *Applied psychology, its principles and methods*, 1927.

[2] Rochester, N. Y., U. S. A.

course in Introductory Psychology, a college course in Physiological Psychology, and a college course in Applied Psychology.

Those who assisted in this investigation passed judgment on the accuracy with which their subjects had answered the questions; and it was necessary for the writer also to form some opinion of the conscientiousness of his assistants in obtaining reliable subjects. All of the subjects were obtained by the writer or by some qualified person on whom he could depend. In every case there was some personal contact between the writer or his assistant, on the one hand, and the subject, on the other. This guarded procedure seemed preferable to the method of obtaining a large number of relatively unknown subjects in groups. The assistants were well acquainted with the subjects they obtained, and in many cases the subjects were their intimate friends or the members of their own immediate families. The results of all of the subjects were examined in a critical way by the writer before being accepted; and the results from about 20 per cent of the subjects were not used.

Some 15 minutes were generally required for the subject to give the desired information. Several items were not included in the printed form that was used because it seemed that the chances would not be favorable to obtaining a frank and accurate reaction. There seemed to be little reason why anyone should hesitate to give accurate answers to all of the questions which were included in the printed form that was used.

A total of 899 subjects was obtained by the method described above, and 439 of these were males, and 460 were females. The subjects were well distributed in age between 10 and 90 years. There were 255 subjects below 20 years of age, and 70 subjects above 60 years of age. Practically all occupations were represented among the subjects, and a relatively large number of subjects was obtained in each of the following groups: grammar school students, high school students, college students, grammar and high school teachers, professional people, business men and women, clerical workers, housewives, and laborers. This large and representative group

of subjects is quite similar in its general nature to the group previously used by the writer in a study of annoyances.[3]

*Daily curves of feeling.* The directions used by the subjects in grading their feelings during the different periods of the day were as follows:

> If +5 represents the *best* anyone can feel, −5 the *worst* anyone can feel, and O the *approximate average feelings of the whole population*, how would you grade your own most customary and representative feelings at *different times during the day*? Place a single number, as −2, +3, or +1, etc., before each of the following:
>
> .....First half hour after getting up
> .....First half of the morning (excluding the first half hour)
> .....Last half of the morning
> .....First half of the afternoon
> .....Last half of the afternoon
> .....First half of the evening
> .....Last half of the evening (excluding last half hour)
> .....Last half hour before going to bed

Each subject was asked first to decide upon his approximate average feeling-score for the whole day, and then to grade the different periods of the day with reference to this central tendency. If, for example, his average feeling-score for the day was approximately +1, the periods of the day when he generally felt his best should be graded above +1, and the periods of the day when he generally felt his worst should be graded below +1. The subject's judgment in regard to his average feeling-score for the whole day is not as reliable as the relative differences between his feeling-scores for the different periods of the day.

Table 1 gives the daily curves of feeling for the age and sex groups, and table 2 gives the same for eight different occupations. The first three columns of table 1 show the total number of subjects of each sex in each of the eight age groups. The

[3] The data on subjects are given in Tables 6A, 6B, and 6C, in Common annoyances; a psychological study of every-day aversions and irritations, *Psychological Monographs*, 1930, *40*, No. 182. Pp. 218.

eight columns in the central portion of the table give the average grades of the two sexes and of the eight age groups for each of

TABLE 1

*Daily curves of feeling*

| AGE | SEX | NUMBER OF SUBJECTS | DAILY CURVES OF FEELING | | | | | | | | AVERAGE | AVERAGE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | First half hour | Morning | | Afternoon | | Evening | | Last half hour | | |
| | | | | First half | Last half | First half | Last half | First half | Last half | | | |
| 10–15 | M. | 59 | 1.2 | 1.6 | 1.7 | 1.5 | 2.2 | 2.1 | 1.1 | 0.1 | 1.4 | 1.5 |
| | F. | 59 | 0.5 | 1.7 | 1.2 | 2.3 | 1.6 | 2.3 | 1.7 | 0.9 | 1.5 | |
| 15–20 | M. | 74 | 0.2 | 1.4 | 0.9 | 1.4 | 1.6 | 2.0 | 1.7 | 0.8 | 1.3 | 1.5 |
| | F. | 63 | 0.7 | 1.8 | 1.3 | 2.2 | 2.1 | 2.1 | 2.4 | 1.2 | 1.7 | |
| 20–25 | M. | 76 | 0.2 | 1.7 | 1.7 | 1.6 | 1.4 | 1.8 | 1.9 | 0.9 | 1.4 | 1.5 |
| | F. | 71 | 0.3 | 2.0 | 1.8 | 1.7 | 1.3 | 2.2 | 2.0 | 0.8 | 1.5 | |
| 25–30 | M. | 50 | 0.1 | 1.9 | 2.1 | 1.0 | 1.3 | 2.3 | 2.1 | 1.0 | 1.5 | 1.6 |
| | F. | 44 | 0.6 | 2.5 | 2.2 | 1.5 | 1.1 | 2.2 | 1.8 | 1.1 | 1.6 | |
| 30–40 | M. | 55 | 1.0 | 2.0 | 2.2 | 1.7 | 1.5 | 1.8 | 2.1 | 1.1 | 1.7 | 1.5 |
| | F. | 71 | 0.2 | 1.9 | 2.0 | 1.8 | 1.2 | 1.8 | 1.7 | 0.7 | 1.4 | |
| 40–50 | M. | 54 | 1.1 | 2.1 | 1.9 | 2.0 | 1.4 | 1.4 | 0.8 | 0.1 | 1.4 | 1.1 |
| | F. | 72 | 0.3 | 1.6 | 1.5 | 0.8 | 0.9 | 1.1 | 0.8 | 0.3 | 0.9 | |
| 50–60 | M. | 35 | 0.4 | 1.7 | 1.6 | 2.1 | 1.2 | 1.5 | 1.5 | 0.9 | 1.4 | 1.3 |
| | F. | 46 | 0.9 | 2.0 | 1.7 | 1.3 | 1.5 | 1.6 | 1.1 | 0.3 | 1.3 | |
| 60–90 | M. | 36 | 1.0 | 1.6 | 1.6 | 1.6 | 0.4 | 1.1 | 0.9 | 0.2 | 1.1 | 0.9 |
| | F. | 34 | 0.2 | 1.3 | 1.1 | 0.3 | 1.2 | 1.2 | 0.5 | −0.2 | 0.7 | |
| Aver-age. | M. | (439) | 0.7 | 1.8 | 1.7 | 1.6 | 1.4 | 1.8 | 1.5 | 0.6 | 1.4 | 1.4 |
| | F. | (460) | 0.5 | 1.9 | 1.6 | 1.5 | 1.4 | 1.8 | 1.5 | 0.6 | 1.3 | |
| Average... | | (899) | 0.6 | 1.8 | 1.7 | 1.6 | 1.4 | 1.8 | 1.5 | 0.6 | 1.4 | |

the eight periods of the day. In the case of the 59 male subjects between 10 and 15 years of age, for example, the average

feeling-score for the first half hour after getting up is 1.2, for the first half of the morning the average feeling-score for this group is 1.6, for the last half of the morning it is 1.7, etc. The average of the eight feeling-scores of this group of subjects, or the eight different periods of the day, is shown in next to the last column, and this score is 1.4. The average for both sexes

TABLE 2

*Daily curves of feeling*

| OCCUPATIONAL ACTIVITY | NUMBER OF SUBJECTS | | | DAILY CURVES OF FEELING | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Morning | | After-noon | | Evening | | | | |
| | Males | Females | Both sexes | First half hour | First half | Last half | First half | Last half | First half | Last half | Last half hour | AVERAGE |
| High School Students | 27 | 38 | 65 | 0.5 | 1.6 | 1.0 | 1.7 | 2.3 | 2.3 | 2.0 | 0.9 | 1.5 |
| College Students | 36 | 14 | 50 | −0.4 | 1.4 | 1.3 | 1.3 | 1.0 | 1.8 | 2.0 | 0.9 | 1.2 |
| Grammar and High School Teachers | 24 | 58 | 82 | 1.0 | 2.9 | 2.4 | 1.7 | 0.5 | 2.0 | 1.8 | 0.7 | 1.6 |
| Professional | 46 | 7 | 53 | −0.2 | 1.8 | 1.5 | 0.8 | 0.7 | 1.6 | 1.7 | 0.8 | 1.1 |
| Business | 69 | 20 | 89 | 1.0 | 2.1 | 2.3 | 2.3 | 1.7 | 2.1 | 1.8 | 0.9 | 1.8 |
| Clerical Workers | 15 | 48 | 63 | 0.6 | 2.0 | 1.9 | 1.7 | 1.5 | 2.0 | 2.1 | 1.3 | 1.6 |
| Housewives with at Least One Child under 20 | | 61 | 61 | 0.2 | 1.3 | 1.5 | 0.7 | 1.3 | 1.1 | 0.6 | 0.1 | 0.9 |
| Skilled Laborers | 51 | 5 | 56 | 0.3 | 1.6 | 1.6 | 1.8 | 1.2 | 1.5 | 1.4 | 0.8 | 1.3 |
| Average | (268) | (251) | (519) | 0.4 | 1.8 | 1.7 | 1.5 | 1.3 | 1.8 | 1.7 | 0.3 | 1.4 |

ages 10 to 15 years, is given in the last column, and this score is 1.5.

The last two rows in table 1 show the averages for each of the eight periods during the day, for all of the 899 subjects combined. Equal weight has been given to the two sexes and to the eight age groups in the calculation of these averages. The figures in the last row of the table show that the feelings are

lowest (at 0.6) during the first and last half hours of the day. The general level of feelings is relatively high (at 1.8) during the first half of the morning, and it is slightly lower (at 1.7) during the last half of the morning. The feelings have an average value of 1.6 during the first half of the afternoon, and an average value of 1.4 during the last half of the afternoon. They are at a high average level of 1.8 during the first half of the evening, and have an average value of 1.5 during the last half of the evening. The average scores decrease 0.1 during the morning, 0.2 during the afternoon, and 0.3 during the evening. There are marked individual variations from these average figures in the case of many of the individual subjects, and several deviations for the sex and age groups are shown in the central portion of the table.

In table 2 are given the daily curves of feeling for eight occupational groups. The group in table 1 which includes ages 10 to 15 years practically coincides with the subjects who were attending grammar school, and the results for these subjects are not reproduced again in table 2. There are several differences between the daily curves of feeling for the eight occupational groups, but these results agree quite well with each other in the fact that the feelings during the first and last half hours of the day have the lowest average values. The average results in the last row of table 2 also show that the feelings fall off slightly during the morning, afternoon, and evening periods.

*Weekly curves of feeling.* Similar instructions were used by the subjects in grading their feelings on the different days of the week:

> If +5 represents the *best* anyone can feel, −5 the *worst* anyone can feel, and O the *approximate average feelings of the whole population*, how would you grade your own most customary and representative feelings during the different *days of the week*? Place a single number, as +4, −3, or −2, etc., before each of the following:
>
> .....Monday
> .....Tuesday
> .....Wednesday
> .....Thursday
> .....Friday
> .....Saturday
> .....Sunday

The average results for the age and sex groups are given in table 3, and the average results for the eight occupations are

TABLE 3

*Weekly curves of feeling*

| AGE | SEX | NUMBER OF SUBJECTS | WEEKLY CURVES OF FEELING | | | | | | | AVERAGE | AVERAGE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday | | |
| 10–15 | M. | 59 | 1.5 | 1.6 | 1.5 | 2.1 | 2.1 | 2.6 | 2.0 | 1.9 | 1.8 |
| | F. | 59 | 1.2 | 1.4 | 1.3 | 1.3 | 1.8 | 1.4 | 2.9 | 1.6 | |
| 15–20 | M. | 74 | 0.7 | 1.1 | 1.8 | 1.5 | 2.2 | 2.5 | 1.7 | 1.6 | 1.7 |
| | F. | 63 | 0.3 | 1.5 | 1.8 | 1.8 | 2.3 | 2.5 | 2.5 | 1.8 | |
| 20–25 | M. | 76 | 0.5 | 1.5 | 1.6 | 1.7 | 1.9 | 2.3 | 2.0 | 1.6 | 1.6 |
| | F. | 71 | −0.4 | 1.2 | 2.1 | 2.0 | 2.0 | 2.3 | 1.6 | 1.5 | |
| 25–30 | M. | 50 | 0.9 | 1.6 | 1.7 | 1.6 | 1.7 | 2.0 | 2.1 | 1.7 | 1.7 |
| | F. | 44 | 1.0 | 1.8 | 2.1 | 1.6 | 1.7 | 2.0 | 2.3 | 1.8 | |
| 30–40 | M. | 55 | 1.2 | 2.0 | 1.8 | 1.7 | 1.8 | 1.7 | 1.8 | 1.7 | 1.7 |
| | F. | 71 | 1.2 | 1.8 | 1.9 | 1.5 | 1.5 | 1.9 | 2.0 | 1.7 | |
| 40–50 | M. | 54 | 0.8 | 1.7 | 1.7 | 1.7 | 1.5 | 1.4 | 1.9 | 1.5 | 1.4 |
| | F. | 72 | 0.6 | 1.3 | 1.6 | 1.6 | 1.2 | 1.5 | 1.2 | 1.3 | |
| 50–60 | M. | 35 | 0.9 | 1.6 | 1.5 | 1.4 | 1.3 | 1.3 | 1.4 | 1.3 | 1.4 |
| | F. | 46 | 1.2 | 1.5 | 1.8 | 1.7 | 1.1 | 1.0 | 1.4 | 1.4 | |
| 60–90 | M. | 36 | 0.8 | 1.3 | 1.6 | 1.6 | 1.1 | 1.3 | 1.9 | 1.4 | 1.2 |
| | F. | 34 | 0.9 | 1.2 | 1.1 | 1.1 | 0.7 | 1.1 | 1.1 | 1.0 | |
| Average. | M. | (439) | 0.9 | 1.6 | 1.7 | 1.7 | 1.7 | 1.9 | 1.9 | 1.6 | 1.6 |
| | F. | (460) | 0.8 | 1.5 | 1.7 | 1.6 | 1.5 | 1.7 | 1.9 | 1.5 | |
| Average..... | | (899) | 0.8 | 1.5 | 1.7 | 1.6 | 1.6 | 1.8 | 1.9 | 1.6 | |

shown in table 4. For practically all of the 24 groups of subjects, the average feeling-scores are at the lowest point of the week on Monday. There is some tendency for Saturday and

Sunday to be the best days of the week as far as feelings are concerned. There are marked variations in the grades of individual subjects, and several differences between the average scores for groups of subjects are shown in the two tables.

TABLE 4
*Weekly curves of feeling*

| OCCUPATIONAL ACTIVITY | NUMBER OF SUBJECTS | | | WEEKLY CURVES OF FEELING | | | | | | | AVERAGE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Male | Female | Both sexes | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday | |
| High School Students. | 27 | 38 | 65 | 0.0 | 1.0 | 1.8 | 1.7 | 2.5 | 2.4 | 2.2 | 1.7 |
| College Students..... | 36 | 14 | 50 | 0.4 | 1.1 | 1.4 | 1.4 | 2.0 | 2.5 | 1.3 | 1.4 |
| Grammar and High School Teachers..... | 24 | 58 | 82 | 1.3 | 1.9 | 2.1 | 1.4 | 1.4 | 2.2 | 1.9 | 1.7 |
| Professional..... | 46 | 7 | 53 | 0.4 | 1.4 | 1.4 | 1.4 | 1.4 | 1.5 | 1.0 | 1.2 |
| Business..... | 69 | 20 | 89 | 1.4 | 2.1 | 1.9 | 1.9 | 1.8 | 1.8 | 2.2 | 1.9 |
| Clerical Workers..... | 15 | 48 | 63 | −0.1 | 1.5 | 1.8 | 1.9 | 1.7 | 2.7 | 2.3 | 1.7 |
| Housewives with at Least One Child under 20..... | | 61 | 61 | 0.8 | 0.7 | 1.6 | 1.7 | 1.4 | 1.4 | 1.3 | 1.3 |
| Skilled Laborers..... | 51 | 5 | 56 | 0.3 | 1.3 | 1.7 | 1.6 | 1.7 | 1.3 | 1.9 | 1.4 |
| Average..... | (268) | (251) | (519) | 0.6 | 1.4 | 1.7 | 1.6 | 1.7 | 2.0 | 1.8 | 1.5 |

*Yearly curves of feeling.* Similar instructions were used by the subjects in grading their feelings during the different months of the year:

> How do you generally feel during the different *months of the year*? Grade each of the following by a single number on this same scale from +5 to −5:
>
> .....January
> .....February
> .....March
> .....April
> .....May
> .....June
> .....July
> .....August
> .....September
> .....October
> .....November
> .....December

The average results for the yearly curves of feeling, for 24 groups of subjects, are given in tables 5 and 6. The last row in these tables shows that for the whole group of subjects, feelings are at the lowest levels of the year during January, February, and March. The curve of feelings then rises markedly during April and May, and reaches a high point in June. The general level is slightly lower during July and August, and reaches another high point in September. The average scores then fall off markedly during October, November, and December, down again to the low level of January, February, and March. There are marked fluctuations in the grades of individual subjects, but the average results for the different groups of subjects represented in the tables show an unusual similarity to each other.[4]

*Sex differences.* Tables 1, 3, and 5 afford data for a comparison between the average feeling-scores of the two sexes. The figures in next to the last row of these tables show that the curves for the two sexes have practically the same absolute values and in fact almost coincide. None of the very small differences in the average feeling-scores between the sexes are reliable; and the results seem to indicate that there are no striking differences between the sexes. If there were any marked differences between the sexes, it seems that they should have appeared in the results with the procedure that was used.

*Age differences.* The last column of tables 1, 3, and 5 afford data for a comparison between the average feeling-scores of the eight age groups. Average feeling-scores were calculated for the eight age groups in the case of each of these three tables, in connection with the daily, weekly, and yearly curves of feeling.

[4] It is probable that somewhat different results might be obtained if similar data were collected from people living in a climate which contrasts sharply with that prevailing in the region of Rochester, New York.

TABLE 5

*Yearly curves of feeling*

| AGE | SEX | NUMBER OF SUBJECTS | YEARLY CURVES OF FEELING | | | | | | | | | | | | AVERAGE | AVERAGE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | January | February | March | April | May | June | July | August | September | October | November | December | | |
| 10–15 | M. | 59 | 1.3 | 1.2 | 1.5 | 1.8 | 2.2 | 2.8 | 2.9 | 2.6 | 1.8 | 1.6 | 1.6 | 1.9 | 1.9 | 2.0 |
| | F. | 59 | 1.3 | 1.6 | 1.7 | 2.1 | 2.5 | 2.8 | 2.4 | 2.4 | 2.1 | 1.5 | 1.5 | 2.2 | 2.0 | |
| 15–20 | M. | 74 | 0.4 | 0.3 | 0.5 | 1.2 | 2.0 | 2.7 | 2.8 | 2.9 | 2.3 | 2.0 | 1.2 | 1.3 | 1.6 | 1.8 |
| | F. | 63 | 1.0 | 1.0 | 0.7 | 1.5 | 2.6 | 2.7 | 2.6 | 2.9 | 2.1 | 2.3 | 1.5 | 1.9 | 1.9 | |
| 20–25 | M. | 76 | 1.0 | 0.9 | 0.7 | 1.2 | 2.2 | 2.6 | 2.3 | 2.2 | 2.4 | 2.0 | 1.6 | 1.3 | 1.7 | 1.8 |
| | F. | 71 | 0.9 | 0.8 | 0.8 | 1.5 | 2.4 | 2.5 | 2.3 | 2.4 | 2.8 | 2.4 | 1.8 | 2.0 | 1.9 | |
| 25–30 | M. | 50 | 0.5 | 0.2 | 0.7 | 1.6 | 2.4 | 2.9 | 2.3 | 2.2 | 2.5 | 2.3 | 1.6 | 1.3 | 1.7 | 1.8 |
| | F | 44 | 0.8 | 1.0 | 0.8 | 1.8 | 2.4 | 2.5 | 2.0 | 2.1 | 2.5 | 2.6 | 1.9 | 1.6 | 1.8 | |
| 30–40 | M. | 55 | 0.6 | 0.3 | 0.5 | 1.6 | 2.4 | 2.4 | 2.1 | 2.1 | 2.4 | 2.4 | 1.7 | 1.4 | 1.7 | 1.6 |
| | F. | 71 | 0.7 | 0.6 | 0.7 | 1.3 | 2.0 | 2.0 | 1.7 | 1.7 | 2.4 | 2.6 | 1.8 | 1.2 | 1.6 | |
| 40–50 | M. | 54 | 0.5 | 0.7 | 0.7 | 1.1 | 1.9 | 2.2 | 1.4 | 1.4 | 1.6 | 1.4 | 0.9 | 0.6 | 1.2 | 1.2 |
| | F. | 72 | 0.5 | 0.4 | 0.3 | 1.2 | 1.7 | 1.8 | 1.2 | 1.2 | 1.3 | 1.8 | 1.2 | 0.8 | 1.1 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50–60 | M. | 35 | 0.5 | 0.7 | 0.7 | 1.5 | 1.9 | 2.0 | 1.8 | 1.8 | 2.3 | 2.1 | 1.5 | 1.1 | 1.5 | 1.5 |
| | F. | 46 | 0.6 | 0.4 | 0.5 | 1.3 | 1.8 | 2.3 | 2.0 | 1.9 | 2.5 | 2.1 | 1.2 | 1.0 | 1.5 | |
| 60–90 | M. | 36 | 0.6 | 0.4 | 0.6 | 1.4 | 1.8 | 1.9 | 2.0 | 1.9 | 2.1 | 2.3 | 1.2 | 0.8 | 1.4 | 1.1 |
| | F. | 34 | −0.1 | 0.1 | 0.1 | 0.9 | 1.5 | 1.3 | 0.9 | 1.0 | 1.5 | 1.5 | 0.6 | 0.3 | 0.8 | |
| Average. | M. | (439) | 0.7 | 0.6 | 0.7 | 1.4 | 2.1 | 2.4 | 2.2 | 2.1 | 2.2 | 2.0 | 1.4 | 1.2 | 1.6 | 1.6 |
| | F. | (460) | 0.7 | 0.7 | 0.7 | 1.5 | 2.1 | 2.2 | 1.9 | 2.0 | 2.2 | 2.1 | 1.4 | 1.4 | 1.6 | |
| Average..... | | (899) | 0.7 | 0.7 | 0.7 | 1.4 | 2.1 | 2.3 | 2.0 | 2.0 | 2.2 | 2.1 | 1.4 | 1.3 | 1.6 | |

TABLE 6

*Yearly curves of feeling*

| OCCUPATIONAL ACTIVITY | NUMBER OF SUBJECTS | | | YEARLY CURVES OF FEELING | | | | | | | | | | | | AVERAGE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Male | Female | Both sexes | January | February | March | April | May | June | July | August | September | October | November | December | |
| High School Students | 27 | 38 | 65 | 1.0 | 0.8 | 0.8 | 1.4 | 2.5 | 2.7 | 2.9 | 3.0 | 2.2 | 2.3 | 1.5 | 1.7 | 1.9 |
| College Students | 36 | 14 | 50 | 0.8 | 0.8 | 0.6 | 1.4 | 2.2 | 2.6 | 2.6 | 2.6 | 2.4 | 2.3 | 1.5 | 1.2 | 1.8 |
| Grammar and High School Teachers | 24 | 58 | 82 | 1.0 | 1.0 | 0.8 | 1.3 | 2.1 | 1.8 | 2.2 | 2.4 | 2.8 | 2.9 | 2.1 | 1.7 | 1.8 |
| Professional | 46 | 7 | 53 | 0.1 | −0.1 | 0.4 | 1.2 | 2.1 | 2.4 | 1.8 | 1.8 | 2.3 | 2.2 | 1.4 | 0.8 | 1.4 |
| Business | 69 | 20 | 89 | 1.1 | 0.9 | 1.0 | 1.8 | 2.4 | 2.6 | 2.5 | 2.2 | 2.5 | 2.4 | 1.9 | 1.6 | 1.9 |
| Clerical Workers | 15 | 48 | 63 | 0.7 | 0.5 | 0.7 | 1.7 | 2.3 | 2.6 | 2.0 | 2.1 | 2.5 | 2.2 | 1.6 | 1.4 | 1.7 |
| Housewives with at Least One Child under 20 | | 61 | 61 | 0.4 | 0.4 | 0.6 | 1.0 | 1.7 | 2.2 | 1.6 | 1.5 | 1.7 | 1.6 | 0.7 | 0.4 | 1.2 |
| Skilled Laborers | 51 | 5 | 56 | 0.4 | 0.4 | 0.5 | 1.3 | 1.9 | 1.9 | 1.6 | 1.5 | 1.9 | 1.7 | 0.8 | 0.6 | 1.2 |
| Average | (268) | (251) | (519) | 0.7 | 0.6 | 0.7 | 1.4 | 2.2 | 2.4 | 2.2 | 2.1 | 2.3 | 2.2 | 1.4 | 1.2 | 1.6 |

When these results are combined, the following average feeling-scores for the different age groups are obtained:

| AGE GROUP | NUMBER OF SUBJECTS | AVERAGE FEELING-SCORE |
|---|---|---|
| 10–15 | 118 | 1.77 |
| 15–20 | 137 | 1.67 |
| 20–25 | 147 | 1.63 |
| 25–30 | 94 | 1.70 |
| 30–40 | 126 | 1.60 |
| 40–50 | 126 | 1.23 |
| 50–60 | 81 | 1.40 |
| 60–90 | 70 | 1.07 |

Although there are some irregularities in these results, the feelings seem to be at a lower average level after 40 years of age than before. The very old subjects feel decidedly worse than the subjects below 40 years of age.

*Occupational differences.* The last column of tables 2, 4, and 6 gives the average feeling-scores for the eight occupational groups; and these scores have been calculated in the case of each of the three tables, in connection with the daily, weekly, and yearly curves of feeling. When these results are combined, the following average feeling-scores for the different occupational groups are obtained:

| OCCUPATIONAL GROUP | NUMBER OF SUBJECTS | AVERAGE FEELING-SCORE |
|---|---|---|
| High School Students | 65 | 1.70 |
| College Students | 50 | 1.47 |
| Teachers | 82 | 1.70 |
| Professional | 53 | 1.23 |
| Business | 89 | 1.87 |
| Clerical Workers | 63 | 1.67 |
| Housewives | 61 | 1.13 |
| Skilled Laborers | 56 | 1.30 |

The average feeling-score for the business men and women is relatively high, and the average level of feelings for the housewives is relatively low. The smaller differences between these average scores are not reliable.

*General tendency towards overestimation of feelings.* When the subjects graded their feelings for the different periods of the day, for the different days of the week, and for the different months of the year, they used a scale on which *O* was taken as the average level of feelings for the whole population, $+5$ was taken as the best anyone can feel, and $-5$ as the worst anyone can feel. Theoretically, it might be expected that the whole group of subjects would average approximately *O*. One might suppose that some occupational groups would give an average feeling-score above *O*, and that other occupational groups would give an average score below *O*. In a similar way, one might think that some age groups would give an average feeling-score above *O*, and that other age groups would give an average score below *O*.

However, the average results of every group show a definite tendency towards overestimation of feelings. Tables 1 to 6 show that this optimistic attitude is present in every age and sex group and in every occupation. The same tendency has also been observed in several occupational groups whose average results were not included in tables 2, 4, and 6, on account of the relatively small number of cases. Among these groups whose results were not given separately in the tables are unskilled laborers, artists, nurses, newspaper editors and reporters, tailors, and farmers. Inasmuch as all kinds of people were represented among the subjects, and since the average feeling-score of every group of subjects is decidedly positive, it seems justifiable to conclude that this tendency towards overestimation of the feelings is present in practically all groups of people.

The average feeling-scores are also above zero for each period of the day, for each day of the week, and for each month of the year. In the central portion of table 1, there is only one negative score out of a total of 128 scores, and this value of $-0.2$ is for women 60 to 90 years of age, for the last half hour before going to bed. All of the 127 remaining scores in this table are positive. In the central portion of table 3, the only negative score is for girls 20 to 25 years of age, for Monday. All of the

other scores in this table are also positive. In the central portion of table 5, also, there is only one negative score, and this score is for women 60 to 90 years of age, for the month of January. All of the other scores in this table are likewise positive.

An average feeling-score was also calculated for each of the 899 individual subjects by averaging the grades which each subject gave for the eight different periods of the day. The distribution of these 899 individual feeling-scores is shown in table 7. There are 128 subjects whose average feeling-scores

TABLE 7

*Distribution of individual feeling-scores*

| INDIVIDUAL FEELING-SCORE | NUMBER OF SUBJECTS |
|---|---|
| 4.5 | 8 |
| 4.0 | 29 |
| 3.5 | 61 |
| 3.0 | 61 |
| 2.5 | 72 |
| 2.0 | 95 |
| 1.5 | 111 |
| 1.0 | 119 |
| .5 | 129 |
| 0 | 128 |
| −.5 | 57 |
| −1.0 | 14 |
| −1.5 | 9 |
| −2.0 | 6 |

are zero, 685 whose average feeling-scores are above zero, and 86 whose feeling-scores are below zero. The average of all these individual feeling-scores is +1.34.

The habit of overestimating pleasant feelings and of underestimating unpleasant feelings is apparently quite wide-spread in the population. It is certainly a common and perhaps a universal habit to exaggerate in the direction of the pleasant feelings when someone asks, "How do you feel?," or when a person inquires, "How are you today?" Most people have so many unpleasant feelings that a well established habit of

rationalization is a valuable and almost necessary aid in maintaining their general equilibrium.

Practically everyone has been positively conditioned to cheerful people and negatively conditioned to depressed characters; so that optimism is a socially approved attitude to which all individuals are in some measure susceptible. The existence of a definite tendency towards optimism in judging feelings, which is present in all kinds of people and in the large majority of the individuals in any group, is of special interest and of some general importance in connection with the theoretical question and attempted investigations of the relative frequency and strength of pleasant and unpleasant feelings in every-day life, and of the relative importance of pleasant and unpleasant feelings in motivating conduct.

*Influence of the weather on feelings.* Each of the subjects answered the following questions in regard to the influence of the weather on feelings:

> How many points on this same scale from −5 to +5 are your feelings made better by good weather conditions?.....
> How many points on this same scale from +5 to −5 are your feelings made worse by bad weather conditions?.....

In order to make the meaning of these questions clearer, each subject was asked to assume that on a particular occasion the weather was "average" or "normal," and that it then became decidedly better or worse,—what would be the most customary influence of this change in the weather on his feelings? "Good" weather was defined roughly as whatever was "good" weather for the subject; and similarly for "bad" weather. Each grade for the influence of good or bad weather was either 0, 1, 2, 3, or 4, all grades of 5 being changed to 4.

The average results of all groups of subjects for the influence of the weather on feelings are shown in tables 8 and 9. There are no reliable sex and age differences, but there is another tendency that is quite consistent. In each one of the 24 groups of subjects, the average results show that good weather improves the feelings more than bad weather depresses them.

There are a number of exceptions to this tendency in the case of individual subjects, but it is significant that the greater influence of good weather is definitely shown in the average results of

TABLE 8

*Influence of the weather on feelings*

| AGE | SEX | NUMBER OF SUBJECTS | GOOD WEATHER | BAD WEATHER | AVERAGE | AVERAGE FOR BOTH SEXES | | AVERAGE |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Good weather | Bad weather | |
| 10–15 | M. | 59 | 2.9 | 1.8 | 2.3 | 2.5 | 1.9 | 2.2 |
| | F. | 59 | 2.2 | 2.0 | 2.1 | | | |
| 15–20 | M. | 74 | 2.9 | 2.1 | 2.5 | 2.9 | 1.9 | 2.4 |
| | F. | 63 | 3.0 | 1.8 | 2.4 | | | |
| 20–25 | M. | 76 | 2.4 | 1.7 | 2.0 | 2.6 | 1.8 | 2.2 |
| | F. | 71 | 2.8 | 2.0 | 2.4 | | | |
| 25–30 | M. | 50 | 2.2 | 1.6 | 1.9 | 2.4 | 1.7 | 2.1 |
| | F. | 44 | 2.6 | 1.9 | 2.2 | | | |
| 30–40 | M. | 55 | 2.4 | 2.2 | 2.3 | 2.5 | 2.1 | 2.3 |
| | F. | 71 | 2.6 | 2.1 | 2.3 | | | |
| 40–50 | M. | 54 | 2.1 | 1.9 | 2.0 | 2.2 | 1.8 | 2.0 |
| | F. | 72 | 2.3 | 1.8 | 2.0 | | | |
| 50–60 | M. | 35 | 2.6 | 1.8 | 2.2 | 2.5 | 1.8 | 2.2 |
| | F. | 46 | 2.5 | 1.9 | 2.2 | | | |
| 60–90 | M. | 36 | 2.1 | 2.0 | 2.0 | 2.4 | 2.2 | 2.3 |
| | F. | 34 | 2.7 | 2.4 | 2.5 | | | |
| Average. | M. | (439) | 2.5 | 1.9 | 2.2 | 2.5 | 1.9 | 2.2 |
| | F. | (460) | 2.6 | 2.0 | 2.3 | | | |

every group of subjects. When the results of all of the subjects are combined, the average influence of good weather is for males 2.5, and for females 2.6; and the average influence of bad weather is for males 1.9, and for females 2.0.

To just what extent this result in regard to the apparently greater influence of good weather on the feelings has been influenced by the tendency towards optimism and rationalization, it would be impossible to say.

*Feelings and marital status.* The subjects gave the following information in regard to their marital status:

State whether unmarried, married, divorced, or widowed:.....
If married, divorced, or widowed:
How long married?....., .....
Years Months
Number of children:.....
Age of youngest child:..... Age of oldest child:.....
Years Years

TABLE 9

*Influence of the weather on feelings*

| OCCUPATIONAL ACTIVITY | NUMBER OF SUBJECTS | | | GOOD WEATHER | BAD WEATHER | AVERAGE |
|---|---|---|---|---|---|---|
| | Male | Female | Both sexes | | | |
| High School Students | 27 | 38 | 65 | 3.0 | 1.7 | 2.3 |
| College Students | 36 | 14 | 50 | 2.5 | 2.0 | 2.2 |
| Grammar and High School Teachers | 24 | 58 | 82 | 2.4 | 2.0 | 2.2 |
| Professional | 46 | 7 | 53 | 2.5 | 1.8 | 2.1 |
| Business | 69 | 20 | 89 | 2.4 | 1.9 | 2.2 |
| Clerical Workers | 15 | 48 | 63 | 2.7 | 2.0 | 2.3 |
| Housewives with at Least One Child under 20 | | 61 | 61 | 2.4 | 1.6 | 2.0 |
| Skilled Laborers | 51 | 5 | 56 | 2.6 | 2.4 | 2.5 |
| Average | (268) | (251) | (519) | 2.6 | 1.9 | 2.2 |

Table 10 shows the average feeling-scores of the six groups of subjects arranged according to their marital status. The average feeling-score of each individual subject was calculated on the basis of the eight grades which he gave for his feelings for the eight different periods of the day. The two groups of subjects in table 10 who seem to feel the best are the unmarried and

those who are married but who have no children. The married subjects with three or more children and the widowed and divorced seem to feel the worst. These differences should be considered only as correlations, and not necessarily as causal relationships.

TABLE 10

*Feelings and marital status: Ages 25–60*

| MARITAL STATUS | NUMBER OF SUBJECTS | AVERAGE FEELING-SCORE |
|---|---|---|
| Unmarried | 122 | 1.5 |
| Married More than One Year, with No Children | 58 | 1.5 |
| Married, with One Child | 63 | 1.3 |
| Married, with Two Children | 76 | 1.3 |
| Married, with Three or More Children | 69 | 1.0 |
| Widowed, Divorced, etc. | 29 | 1.1 |

TABLE 11

*Feelings and formal school education: Ages 25–60*

| FORMAL SCHOOL EDUCATION | NUMBER OF SUBJECTS | AVERAGE FEELING-SCORE |
|---|---|---|
| Grammar School | 92 | 0.9 |
| High School | 86 | 1.5 |
| Business School | 40 | 1.4 |
| Normal School | 56 | 1.9 |
| Attended College, but Did Not Graduate | 49 | 1.2 |
| Graduated from College | 52 | 1.3 |
| Higher than College | 37 | 1.2 |

*Feelings and formal school education.* Table 11 gives the average feeling-scores for several groups of subjects who have been arranged according to their formal school education. Like the data in table 10, these results are somewhat complicated by the factor of age. Those subjects who have taken a normal school course have a relatively high feeling-score; and the average level of feelings of those who have been to college and of those who have gone beyond the college course are relatively

low. The smaller differences between these average scores are not reliable.

*Feelings and sleeping habits.* The subjects also gave information in regard to the time they generally went to bed, and the number of hours they generally slept; and these results are shown in tables 12 and 13. The subjects who generally go to

TABLE 12

*Feelings and time of going to bed: Ages 20–90*

| TIME OF GOING TO BED | NUMBER OF SUBJECTS | AVERAGE FEELING-SCORE |
|---|---|---|
| Before 10 P.M. (Includes 17 Subjects Over 60) | 49 | 1.0 |
| At 10 P.M. | 116 | 1.2 |
| Between 10 and 11 P.M. | 118 | 1.3 |
| At 11 P.M. | 164 | 1.4 |
| Between 11 and 12 P.M. | 81 | 1.3 |
| At 12 P.M. | 79 | 1.3 |
| After 12 P.M. | 37 | 1.6 |

TABLE 13

*Feelings and amount of sleep: Ages 20–90*

| AMOUNT OF SLEEP | NUMBER OF SUBJECTS | AVERAGE FEELING-SCORE |
|---|---|---|
| Less than 6½ Hours | 56 | 1.4 |
| 6½ Hours | 35 | 1.4 |
| 7 Hours | 130 | 1.3 |
| 7½ Hours | 99 | 1.4 |
| 8 Hours | 184 | 1.3 |
| 8½ Hours | 62 | 1.3 |
| More than 8½ Hours (Includes 17 Subjects Over 60) | 78 | 1.1 |

bed before 10 p.m. seem on the whole to feel the worst, and those who generally go to bed after 12 p.m. seem to feel the best. Subjects who generally sleep more than eight and a half hours seem to feel worse than those who generally sleep eight and a half hours or less. Like other data of this nature, these differences should be considered only as correlations and not necessarily as causal relationships.

*Conclusions.* The method which has been employed in carrying out the study described above is at approximately the same level as the procedure which is frequently used by a physician in inquiring about the feelings of his patient. The patient may not display any unusual symptoms even though he may feel quite badly; and a physician sometimes feels called upon to ask, "How do you feel?," "How did you feel yesterday?," or "How have you felt this Winter?" Asking questions in this straight-forward manner has an obvious practical value and a scientific justification that is more real than imagined.

The present study should be regarded as an investigation at a particular psychological level; and the results which have been obtained could not have been inferred even if more information of a scientific sort had been available on the subject of feelings. The procedure which was used appears to be the only one that could be used in obtaining the information desired. Although any method in which introspective judgments are required has its limitations, it is still true perhaps that the most straightforward and effective way of finding out how a person feels is to ask him. Even if more information were at hand on the physiology of feelings than is actually available at the present time, studies on the present level would still be necessary in order to be more certain of some of the conclusions.

The principal conclusions which seem justified from the results described above are as follows:

1. All kinds of people have a tendency to overestimate their pleasant feelings and to underestimate their unpleasant feelings. This habit of rationalization and attitude of optimism are found in both sexes, in all ages, and in all occupational activities.

2. The average level of feelings is lowest during the first and last half hours of the day.

3. The average level of feelings is lower on Monday than on any of the other days of the week.

4. The average level of feelings is lowest in January, February, and March. The curve rises markedly during April and May, and reaches a high point in June. It is slightly lower in July and August, and reaches another high point in September.

The general average then falls during October, November, and December, back again to the low level of January, February, and March.

5. There are no marked differences between the two sexes in the average level of feelings.

6. The average level of feelings is lower after 40 years of age than before.

# INTELLIGENCE AND MONTH OF BIRTH

RUDOLF PINTNER

*Teachers College, Columbia University*

In a very interesting article Blonsky[1] of Moskau suggests that the month of the year in which a child is born has some influence upon his general bodily and mental development. He brings forward certain data to show this influence. We shall briefly present his evidence and conclusions, and then report certain data of our own.

Blonsky deals with 265 repeaters in school, 453 children tested by the Binet Scale, and 93 cases with physical measurements. Distributing the 265 repeaters according to month of birth, he finds a greater number in the last six as contrasted with the first six months of the year. The first half of the year has 113, the last half 152. Distributing the cases according to seasons, we have spring 48, summer 70, autumn 76, winter 71. The greatest number of cases falls in the three months of October–December, namely 81. The smallest number in March–May, namely 48. Taking 246 regular pupils as controls, he finds the numbers to be 60 and 66 respectively, which show no difference. From these data he argues that a greater number of duller pupils seem to be born in the winter months.

Coming now to the 453 cases tested by the Binet Scale, Blonsky gives the following means:

| | MEAN IQ | n |
|---|---|---|
| Spring | 84.3 | 115 |
| Summer | 81.5 | 111 |
| Autumn | 81.3 | 114 |
| Winter | 80.1 | 113 |
| Total | 82.1 | 453 |

[1] Blonsky, P. P. Früh- und Spätjahrkinder. Jahrbuch fur Kinderheilkunde, 1929, 124, 115–120.

Here we note that the group as a whole is a dull group of children. The mean IQ for the Winter is lowest and for the Spring highest, but the differences between the means are not great. The mean IQ for October-December is 80.1 (n = 103). Comparing the sexes we have:

| | MEAN IQ | n |
|---|---|---|
| March–May: | | |
| Boys | 84.9 | 66 |
| Girls | 83.6 | 49 |
| October–December: | | |
| Boys | 80.3 | 59 |
| Girls | 79.7 | 44 |

Here again we find the same tendency for low IQ's in October–December both for boys and for girls.

With reference to bodily development, Blonsky reports 93 cases, ages 7–8 years, about equal in mental development. Here the differences between March–May and November–December are extremely small, although Blonsky seems to regard them as significant.

On the basis of the above results, Blonsky assumes a real influence on the mental and physical development occasioned by the month of birth. He cites four references to support his argument that the early months of the year, or spring months, are most favorable for the birth of the child, in as much as more growth takes place at that time. He argues that the child gets more light and air in spring as contrasted with the close confinement of winter. Spring is the "season of inner secretions" and these have a direct connection with growth. Children born late in the year are more readily attacked by rachitis and, furthermore, such children are weaned in summer and this brings its particular dangers.

This influence of the month of birth, our author continues, will be more marked among the children of "the masses," rather than among children of well-to-do parents, and his cases are all from a poor environment. Note the mean IQ of 82.1.

The physical factors surrounding the child at birth and immediately thereafter are potent in influencing his mental development. They influence the intellectual development of the child and his school achievement. Then Blonsky ends his article on this lyrical note, in spite of the fact that he fully recognizes that he may appear naïve and ridiculous: "It is not good for mankind first to see the light of day in the last months of the year. Lady Luck smiles on the children of Spring. Mothers, bring forth your children in Spring."

TABLE 1

*Mean IQ by month of birth*

| | MEAN IQ | S.D. | S.D. MEAN | RANGE | n |
|---|---|---|---|---|---|
| January | 95.61 | 18.38 | .859 | 40–160 | 458 |
| February | 96.08 | 17.90 | .868 | 50–145 | 425 |
| March | 96.13 | 18.71 | .912 | 55–175 | 421 |
| April | 96.76 | 19.19 | .938 | 50–170 | 419 |
| May | 97.05 | 17.72 | .914 | 50–150 | 376 |
| June | 97.80 | 19.14 | .936 | 45–170 | 418 |
| July | 97.08 | 18.80 | .948 | 55–150 | 393 |
| August | 96.62 | 18.20 | .860 | 50–145 | 448 |
| September | 97.97 | 17.00 | .823 | 50–150 | 427 |
| October | 98.50 | 18.63 | .870 | 50–180 | 459 |
| November | 95.58 | 18.93 | 1.040 | 50–145 | 331 |
| December | 96.76 | 18.90 | 1.010 | 50–180 | 350 |
| Total | 96.85 | | | | 4,925 |

This theory of Blonsky's is interesting although the evidence he presents hardly seems to justify all his conclusions. The differences between the means are small and may not be significant. Thus there is only a difference of 4.1 IQ points between Winter and Spring. He does not calculate the significance of this difference, nor give the necessary data to calculate it. The question of the repeaters is difficult to judge because of the paucity of information given. Something might depend upon the particular grade in which they are and upon the time of entrance and age of entrance into school. Spring children

might be six months older or younger than Winter children according to the policy of admission into school. In addition to this the number of cases reported by Blonsky is very small. It seemed, therefore, wise to see if a larger number of cases would throw more light on the problem.

Our data consist of 4925 school children of all ages and grades tested by different group intelligence tests, namely, the National Intelligence Test, Pintner Rapid Survey, Terman Group, Otis, Haggerty Delta 1 and Delta 2, Pintner non-Language, Pintner-Cunningham and Detroit First Grade. Distribution tables of

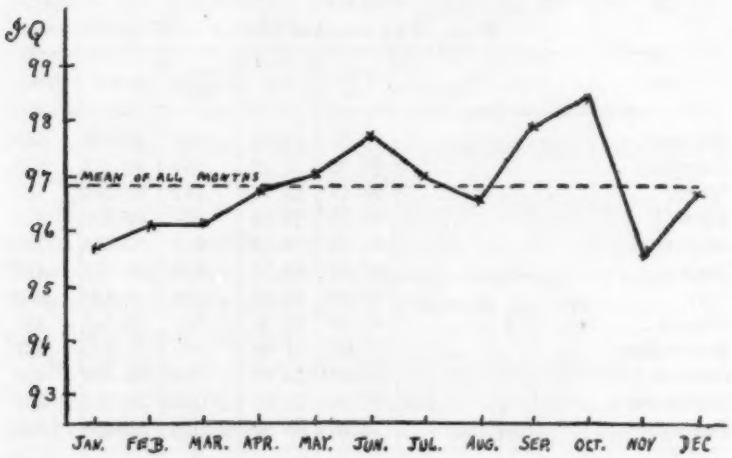


FIG. 1

IQ's by month of birth were made.[2] Table 1 shows the means, standard deviations and so forth for each month. Note that the mean IQ of our 4925 cases is 96.85 which is much higher than the mean IQ of 82.1 for Blonsky's 453 cases. We are not dealing, therefore, with a predominantly dull group, but rather with a normal group. Figure 1 shows graphically the monthly means. These seem to show an upward trend from January to

[2] The writer wishes to acknowledge the help of Mr. George Forlano, graduate student at Teachers College, Columbia University, in preparing these tables and in making the necessary calculations.

June. The means for the last half of the year are, however, very irregular. The correlation ratio ($\eta$) between IQ and month of birth is 0.048 ($\pm$0.002), showing no general relationship between these two variables. The largest difference in IQ between any two months is that between October and November. This amounts to 2.92 IQ points which is only 2.14 times the sigma of the difference between the means, and therefore not statistically significant.

Taking the four seasons we have the following means:

| | MEAN IQ | n |
|---|---|---|
| Spring (April–June) | 97.20 | 1,213 |
| Summer (July–September) | 97.20 | 1,268 |
| Autumn (October–December) | 97.10 | 1,140 |
| Winter (January–March) | 95.95 | 1,304 |

Here our greatest difference lies between January-March and Spring or Summer, and not, as Blonsky found, between October–December and March–May. But again our largest difference is only 1.25 IQ points, and this is only 1.74 times the sigma of the difference of the means.

If we take now the warm months (April to September) and the cold months (October to March) we find:

| | MEAN IQ | S.D. | S.D. MEAN |
|---|---|---|---|
| April–September | 97.20 | 18.37 | 0.369 |
| October–March | 96.50 | 18.58 | 0.376 |

The difference in IQ points is only 0.7, and this is only 1.33 times the sigma of the difference.

Since October has the highest monthly mean let us consider the following division into six months:

| | MEAN IQ |
|---|---|
| November–April | 96.15 |
| May–October | 97.55 |

Here the difference is 1.40 IQ points and this is 2.66 times the sigma of the difference. This is the most significant difference which we have been able to find, but even this difference is not very great. It does, however, lie in the direction indicated by Blonsky, except that in our case October is included among the favorable rather than the unfavorable months.

In general, therefore, we have been unable to find any influence of the month of birth upon the IQ of our cases. In particular we cannot say that October, November and December are especially unfavorable and March, April and May especially favorable, as Blonsky reports. It is true that the winter or cold months have means slightly below the warm months and this is the only indication we can find to support Blonsky's theory. None of the differences found by us are statistically significant. Our findings do not preclude such influence as Blonsky claims. All that we can say is that it is not a general influence among urban children in the United States. Further data will be necessary to check up whether differences may not exist between social groups, well-to-do and poor, between urban and rural groups, northern and southern groups, intelligent and unintelligent and so forth. If such monthly differences exist, and if they depend upon air and sunlight, as Blonsky claims, then they should be found most easily among those living under poor hygienic conditions. A comparison of the IQ's of those living in good and those living in poor hygienic conditions should be made.

# TYPICAL POINTS OF VIEW ON LEARNING PRESENTED TO BEGINNING STUDENTS OF EDUCATION[1]

H. H. REMMERS

*Purdue University*

To attempt to determine in any reliable fashion the typical points of view on learning presented to beginning students of education immediately raises the problem of method. At least four possible alternatives present themselves.

1. One might ask a sampling of typical instructors what point of view if any is championed.

2. One might formulate a valid examination, i.e., one upon which leading exponents of the different points of view would agree, and administer it to those who teach beginning students. The choice of such leaders, I presume, would fall without many dissenting votes upon the following: the late E. B. Titchener for structuralism, President J. R. Angell for functionalism, J. B. Watson for behaviorism, Koehler for Gestalt psychology and Sigmund Freud for psychoanalysis.

3. This same examination might be applied to a random sampling of students who had had an introductory course. This would, no doubt, be the soundest attack upon the problem since we are presumably interested in the point of view which a student assimilates rather than the one or ones to which he is exposed. Had this method been adopted the title of this paper would be misleading to the extent that the point of view presented and the one assimilated failed to coincide.

4. A fourth alternative would be possible through the analysis of the content of textbooks used.

[1] Delivered before the section on Educational Psychology at the National Education Association Meeting, Atlantic City, February 25, 1930.

The difficulties in the way of the second and third possibilities are too obvious and too many to require detailed discussion. Apart from the difficulty of obtaining a statement of what Titchener's views would be in 1930, he himself stated a few years ago that "both 'functional,' and 'structural' as qualifications of 'psychology' are now obsolete terms."[2] Other difficulties relate to limitations of time, space, and cost.

It was therefore decided to make the assumption that the points of view which teachers *say* they present to their students are sufficiently representative to constitute a close approximation of the truth of the matter and a questionnaire was therefore addressed to the members of this organization. Any one who is disposed to cavil at this assumption is free to disregard it and may consider the data to be presented as merely more or less interesting statements of unique responses, the error or bias of which is not known. The writer takes comfort, however, from T. L. Kelley's able analysis of the questionnaire as a tool in research.[3] "If facts known only to specific individuals are desired," he says, "then an oral or written questionnaire addressed to the one person knowing these facts . . . . is surely the only method of approach." And again he states that it is defensible only "where time and cost necessitate it." In the present state of rapid shifting of the psychological stage it may well be questioned whether a costly experimental approach to this problem is justified, even if the means were available. Nevertheless, it is certainly of theoretical and practical interest to attempt to obtain some notion of the methodological presuppositions which our next generation of public school teachers is likely to carry into its professional work.

The questionnaire is given on page 157. No doubt it is open to the usual objections which may be levelled at questionnaires in general. Selective factors, for example, may very likely have operated. The mailing list used was the membership of the National Association of College Teachers of Education. It can

[2] "Functional Psychology and the Psychology of Act," *Am. Jour. Psych.*, 1921, 32, footnote, p. 533.

[3] Scientific Method, *Ohio State University Press*, 1929, p. 39 ff.

### Points of View in Learning as Presented to Beginning Students of Education

I. How is the theory of learning presented to your beginning students in education? Please encircle pertinent items.

1. From the structural point of view only (sensations, percepts, images, affective states, etc.)?..... Yes No
2. From the functional point of view only (sensing, perceiving, imaging, etc.)?..... Yes No
3. From the behavioristic point of view only (S-R, bond psychology)?..... Yes No
4. From the Gestalt point of view only (configuration, pattern, organismic)?..... Yes No
5. From the psychoanalytical point of view only (complexes, repressions, fixations, etc.)?..... Yes No
6. Entirely from laboratory facts as established by
   (a) the students themselves without any attempt to formulate a theoretical point of view related to any of the above?..... Yes No
   (b) by psychological investigators, without any attempt to formulate a point of view related to any of the above?..... Yes No
7. As a combination of two or more of the above?..... Yes No
   If so, please write here the numbers designating the various points of view in the order of emphasis, the most important first.....
8. Other points of view?.....
   .....
9. Name and author of basic textbook used?.....
   .....
10. If syllabus outline or other similar material is furnished the students, please enclose a copy with your reply. Additional postage will be paid at this end.
11. Remarks.....
    .....

II. Concerning the problem of "nature *vs.* nurture" what point of view is given:

1. That it is a pseudo-problem, essentially incapable of solution?..... Yes No
2. That heredity determines very rigidly the extent of an individual's capacity for learning?..... Yes No
3. That the extent to which an individual's learning capacity is developed depends primarily upon the environment..... Yes No

4. That heredity is responsible for approximately —— per cent and environment is responsible for approximately —— per cent? Please fill out blanks if this item applies.
5. If the view point given is not covered by any one of these three, please give a brief statement of it here.....
.....
6. Remarks.....
.....

III. Is the point of view on transfer of training given your beginning students of education that of:
1. Thorndike's "identical elements" theory?..... Yes No
2. Judd's "generalization" theory?..... Yes No
3. That these two points of view are essentially different aspects of the same theory?..... Yes No
4. Gestalt ("insight," "closure")?..... Yes No

IV. Philosophical basis. Are your beginning students made aware of the "mind-body" problem?..... Yes No
If so, please state the point of view presented, as idealism, materialism, dualism, psycho-physical parallelism, etc.....

probably be fairly convincingly argued here that the members of this organization represent a positive selection in the direction of professional competence relative to a mastery of the various possible points of view. Again, if we admit different degrees of competence among this membership, anything short of 100 per cent returns on the questionnaire raises a suspicion of further positive selection in the same direction, since probably those who best understand the differentia of the various points of view would be most likely to respond. If these suppositions are correct, the returns represent a cross section of the points of view stressed by the abler professors of psychology and education.

Further, the wording of the questionnaire may have been inadequate to convey the proper meanings; the various points of view as described in the questionnaire may not have been representative, although from internal evidence this seems unlikely; and, perhaps most important of all, the meanings of the different points of view may differ so radically for different respondents as to make the correctness of the responses in fact a matter of considerable dubiety. Certainly the polemical literature of the last decade or so concerning both behaviorism

and Gestalt psychology indicates that there is considerable room for differences of opinion with reference to the interpretation of points of view.

The metaphysical coloration of the various points of view, however, is probably sufficiently differentiated in even the least well-grounded of psychology teachers as to provide a useful distinction. At any rate, we shall make the assumption.

In the turbulent cosmic weather which characterizes our modern psychology, I find it a matter of distinct gratification that the present report is not concerned with any attempt at commanding the sea to be calm. At least divine powers would be required to do that. The present study, to continue the metaphor, is merely a compilation and interpretation of meteorological observations to indicate at least roughly the direction and velocity of the wind at present and possibly for the immediate future.

## II. THE RESULTS

With all of the foregoing qualifications in mind—or perhaps I should say with all of these qualifications established as electron-proton systems or patterns determinative of future adjustments or equilibria—let us turn to the examination of the results.

Out of 310 questionnaires sent out a total of 195 or 63 per cent were returned. Of these, however, only 138 were usable. A few of these did not answer all of the questionnaire. From the returns it is quite apparent that beginning students of education are not in general being indoctrinated with any one point of view to the exclusion of all others. Not a single respondent espoused structuralism as a completely satisfactory point of view. One person confessed to functionalism as his exclusive creed. Nine were behaviorists exclusively, and one a Gestalt psychologist. Two persons indicate that they present only laboratory facts as established by psychological investigators, and make no attempt to formulate a theoretical point of view. All others, i.e., 117 or 85 per cent of all usable replies indicated that a combination of the various points of view was presented. It is quite evident

that eclecticism is characteristic of introductory psychology as related to the topic of learning. For those of statistical inclination it may be useful to state that the average number of points of view given is 3.2.

In such eclecticism, there would probably be differences in emphasis, and the last part of question I (7) was designed to

TABLE 1

*Distribution of question 7 according to number of time each point of view was ranked first, second, etc.*

| RANKED | STRUCTURALISM | FUNCTIONALISM | BEHAVIORISM | GESTALT | PSYCHOANALYSIS | LABORATORY FACTS | LABORATORY FACTS | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | By students | Psychologists | |
| First | 13 | 26 | 52 | | | 3 | 5 | 10 | 109 |
| Second | 13 | 37 | 21 | 14 | 2 | 5 | 1 | 15 | 108 |
| Third | 11 | 16 | 19 | 13 | 13 | 2 | 4 | 4 | 82 |
| Fourth | 8 | 4 | 5 | 14 | 9 | 6 | | 4 | 50 |
| Fifth | 3 | | | 7 | 7 | 2 | | 5 | 24 |
| Sixth | 1 | | | | 5 | | 4 | 2 | 12 |
| Seventh | | | | 1 | 1 | | 1 | | 3 |
| Total | 49 | 83 | 97 | 49 | 37 | 18 | 15 | 40 | 388 |
| Median rank | 2.4 | 1.9 | 1.4 | 3.3 | 3.9 | 3.0 | 2.9 | 2.2 | |

This table is to be read: Out of a total of 109, structuralism was given first place 13 times, functionalism 26 times, behaviorism 52 times, etc. Structuralism was mentioned a total of 49 times, functionalism 83, behaviorism 97, etc. For those who mention structuralism at all, the median rank is 2.4; for functionalism 1.9, etc.

obtain at least a rough measure of these emphases. Table 1 was constructed to bring out the essential facts.

It is quite obvious that on the face of the returns behaviorism is currently the most popular doctrine. Functionalism comes as a poor second, and structuralism a poor third on the basis of first mention. The median rank given at the bottom of the table may be considered as a sort of index of certainty, for those who

mention a particular point of view, the smaller median indicating most and the larger, least certainty. Here the order of rank is again the same as that given by the criterion of first mention.

TABLE 2

*One textbook only listed*

| | |
|---|---|
| Benson *et al.*—Psychology for Teachers | 2 |
| Breese, B. B.—Psychology | 1 |
| Breitwieser—Psychological Education | 1 |
| Burton—Nature and Direction of Learning | 3 |
| Cameron—Educational Psychology | 3 |
| Colvin—The Learning Process | 2 |
| Cubberley—Introduction to Study of Education | 1 |
| Dashiell—Objective Psychology | 2 |
| Edmonson and Schorling—Problems of the High School Teacher | 1 |
| Frasier and Armentrout. Introduction to Education | 2 |
| Gates—Elementary Psychology | 13 |
| Gates—Psychology for Students of Education | 6 |
| Grizzell—Education | 1 |
| Jordan—Educational Psychology | 6 |
| Judd—(Not specified) | 1 |
| Odgen, R. M.—Psychology and Education | 1 |
| Parker—General Methods of Teaching in Elementary Schools and Methods of Teaching in High School | 1 |
| Pintner—Educational Psychology | 1 |
| Pyle—Psychology of Learning | 1 |
| Sandiford—Educational Psychology | 7 |
| Starch—Educational Psychology | 4 |
| Strebel and Morehart—The Nature and Meaning of Teaching | 1 |
| Strong—Introductory Psychology for Teachers | 1 |
| Thorndike—Educational Psychology | 2 |
| Watson and Spence—Education Problems for Psychology | 1 |
| Woodworth—Psychology | 1 |
| Total | 66 |

In order not to load the dice in favor of the alternatives presented in the questionnaire, question I (8) was inserted, asking respondents to list any other points of view. Only 19 replies were received, and these were classifiable as eclectic or or-

TABLE 3

*Number of times each author was mentioned either as single textbook or in combination with other textbook*

| | | | | |
|---|---|---|---|---|
| Averill | 1 | | Parker | 2 |
| Benson, *et al* | 3 | | Pillsbury | 1 |
| Breese | 1 | | Pintner | 3 |
| Breitwieser | 1 | | Pyle | 2 |
| Book | 1 | | Robinson | 1 |
| Burnham | 1 | | Sandiford | 10 |
| Burton | 3 | | Starch | 10 |
| Colvin | 2 | | Strong | 1 |
| Cameron | 4 | | Thorndike | 10 |
| Clem | 1 | | Watson | 1 |
| Crawford | 1 | | Werner | 1 |
| Cubberley | 2 | | Wheeler | 2 |
| Dashiell | 6 | | Whipple | 1 |
| Gates Elementary Psychology | 28 | | Wilson | 1 |
| Gates Psychology for Students of Education | 14 | 42 | Woodworth | 8 |
| Griffith | 1 | | Colvin and Bagley | 1 |
| Grizzell | 2 | | Clapp, Close and Merriman | 1 |
| Headley | 1 | | Edmonson and Schorling | 1 |
| Holt | 1 | | Freeland Adams and Hall | 1 |
| Howerth | 1 | | Frasier and Armentrout | 5 |
| Jordan | 14 | | Morgan and Gilliland | 1 |
| Judd | 2 | | Norsworthy and Whitley | 1 |
| Koffka | 1 | | Perrin and Klein | 3 |
| Lull | 1 | | Smith and Guthrie | 2 |
| McDougall | 1 | | Stormzand and McKee | 1 |
| Mead | 1 | | Strebel and Morehart | 1 |
| Monroe | 1 | | Watson and Spence | 1 |
| Mueller | 1 | | Total | 171 |
| Ogden | 1 | | | |

TABLE 4

*A summary of answers to the first three questions on "nature vs nurture"*

| | YES | NO |
|---|---|---|
| 1. A pseudo-problem | 31 | 26 |
| 2. Heredity rigidly determines learning capacity | 34 | 26 |
| 3. Development of learning capacity primarily a function of environment | 37 | 21 |

ganismic. All of them, as might be expected, showed heavy leanings toward practical applications. A very representative statement follows: "Points of view on all [are] presented as phases of a unitary organism . . . . different aspects of a single complex phenomenon."

Another respondent makes the following comment.

"Some of my students have thought that I am a 'behaviorist,' others a 'Gestaltist,' and at least one has asked if I am a 'psychoanalyst.' . . . Near the close of the course I give what I term a 'super-view,' and the above is cleared up. Within the limitations of our combined abilities, we endeavor to take what is best [of the various points of view] upon the basis of objective evidence. Certain elements are studied somewhat didactically, namely, the basis of transfer of training and the laws of learning [for] which . . . we lean upon Dr. Thorndike for help."

TABLE 5

*A summary of replies giving in terms of percentage the extent to which heredity and environment are responsible for learning*

| HEREDITY | ENVIRONMENT | NUMBER OF VOTES |
|---|---|---|
| *per cent* | *per cent* | |
| 0 | 100 | |
| 10 | 90 | 2 |
| 25 | 75 | 4 |
| 50 | 50 | 18 |
| 75 | 25 | 14 |
| 90 | 10 | 2 |
| 100 | 0 | |
| Total..... | | 40 |

The inference that eclecticism as the rule is further borne out by a tabulation of the textbooks used as given under question (9). Table 2 includes only those who gave a single basic textbook, while table 3 gives both those listed in table 1 and all those listing two or more books. Clearly the temper of electicism is shown by the fact that the two elementary textbooks by Gates are mentioned three times as often as that of his nearest competitor. Gates' textbooks are eminently eclectic, in that the various schools of psychology are mentioned and various parts

of their stock-in-trade taken over wherever the judgment of the author has so dictated.

The problem of "nature *vs.* nurture" has evidently changed its meaning in recent years. Where once there was no hesitancy in making such a dichotomy—as witness any textbook in psychology of ten years ago—there is now a noticeable lack of willingness to so dichotomize. Some of the comments accompanying the returned questionnaires indicate that the problem states as "nature *vs* nurture" is unacceptable since both are complementary to each other.[4] In any case, table 4 gives a summary of the responses for what they are worth.

Question 4 on "nature *vs.* nurture" called for a percentage statement of the extent to which heredity and environment respectively are responsible for learning capacity. Forty persons were willing to go on record as giving definite quantitative statements. In fairness to them it should be said that probably in many if not most cases this represents a statistical average under present average conditions of learning. In order to throw these replies into relief table 5 was prepared.

It appears that these replies are at least fairly consistent with the trend shown in the answers to questions 1 to 3. The hereditarians have a slight preponderance in the sense that on the whole a slightly larger percentage of potency is voted to heredity.

The point of views concerning the problem of transfer of training yielded the results shown in table 6. The important votes here are clearly the yes votes. The affirmation of one of these, No. (3) for example, may and probably does leave the

[4] See Freeman, Frank S. "Intelligence Tests and the Nature-Nurture Controversy," *School and Society*, December 21, 1929, pp. 830–836 for a recent discussion of this problem as it relates to the psychology of learning. The opposition of nature and nurture, he points out, is a "gratuitous opposition of two aspects of a single function . . . . aspects which cannot be separated into independent entities." If I may be permitted an analogy, the question, which is the more important —heredity or environment? is like asking, Which is the more important in producing a boiled egg—the water or the egg?

respondent relatively indifferent with respect to denial of the other alternatives, since his affirmation already implicitly denies the exclusive espousal of the others. It would be interesting to know in passing where the respective respondents to questions (1) and (2) did their graduate work. It is very likely that such knowledge would show "idols of the den" related to Columbia University and Chicago University.

These results indicate that the atomistic point of view as opposed to a metaphysics and psychology of Gestalt is still the vastly dominant explanatory principle. The biological, organismic point of view of H. S. Jennings, Child, and others and the Gestalt metaphysics and psychology of Wertheimer, Koffka, Koehler and others is in a nascent state. An inventory in

TABLE 6

*A summary of replies concerning points of view on transfer of training*

| | YES | NO |
|---|---|---|
| 1. Thorndike's "identical elements" theory.. | 66 | 10 |
| 2. Judd's "generalization" theory..... | 43 | 14 |
| 3. Theories (1) and (2) different aspects of same theory..... | 86 | 16 |
| 4. Gestalt ("insight," "closure")..... | 17 | 16 |

1935 similar to the present one should be highly interesting and instructive in revealing the changes of fortune of the various systematic psychologies. Since incorrect prophecies are promptly forgotten in any case if events prove them incorrect, I shall prophesy that such an inventory will show a greater proportion of devotees to the organismic point of view than the present study reveals.

The returns on the "mind-body" problem—a problem which G. Stanley Hall characterized in his autobiography as "a meatless bone" for psychologists to chew on, with the implication that it lacks marrow as well as meat—lead to an interestingly even division of opinion. Out of 106 replies, exactly half answer the question, "Are your beginning students made aware

of the 'mind-body' problem?" in the negative, and the other half in the affirmative. It is interesting to note in passing that in the Psychologies of 1925 those who address themselves specifically to a consideration of this problem at all dispose of it by relegating it to the philosophers, stating in effect that it lies outside the realm of psychological problems.

Fifty-eight persons complied with the request to indicate the philosophical point of view presented. A summary of these classifies 17 under some form of monism chiefly materialistic, and 24 as dualistic. Eight replies say that no emphasis is given—that all views are presented—while the rest give one or two scattering votes to pragmatism, creative evolution, and "genetic point of view." It is very likely that our "practical" temper as a nation is reflected in a marked degree of impatience with over-fine rationalization—I use the word in the logical and not in the psychological sense—of our bases of thought and action. There is doubtless also operative the pedagogical consideration that beginning students will be confused rather than oriented by a brief and inadequate study of the philosophical aspects of the learning problem, which leads in practice to a "common sense" appreciation of the problem. The student of the history of human thought has little difficulty in recognizing "common sense" in psychological thinking as seventeenth century philosophical thinking.

In summary, then, a fairly large sampling of the views of the members of the National Society of College Teachers of Education shows the prevailing temper to be pronounced in its eclecticism, with very strong leanings toward behaviorism. Notwithstanding the fact that Gestalt psychologists assert in no uncertain terms that all the earlier points of view are logically and methodologically incompatible with Gestalt psychology, a major portion of the replies to the questionnaire used in this study indicates that logic and methodology are by no means insuperable obstacles to a practical if not a systematic synthesis of the various points of view.

The study indicates that thinking on the "nature *vs.* nurture" problem is rapidly shifting from an outworn spurious dichotomy

to a point of view which regards these concepts as the extremes of a single complex function, and that this point of view definitely colors thinking on the problem of transfer of training.

Philosophically we appear to be somewhat at sixes and sevens. The readjustments in other sciences, particularly in physics and biology are beginning, however, to have decided echoes in psychology even as presented to beginning students interested presumably chiefly in practical applications.

In the view of the present writer the situation revealed by the foregoing data is not one to cause either alarm or despair. On the contrary, it is distinctly a cause for optimism concerning the future. Differing points of view in psychology are so many different ways of formulating the problems of research. Systems as systems are integrations of the available data of the science of psychology, and are either relatively utile or futile as they do or do not present fruitful hypotheses which are amenable to experimental attack.

Viewed in this way a multiplicity of points of view is in the present status of our very youthful science a distinct advantage. Possibly in a hundred or two hundred years it will be possible to have a system of psychological concepts with connotations as definite and precise and as free from controversy as those of the older sciences. That we have not, is no indictment of psychology or psychologists. Only those who are in search of the will-o-the-wisp of a philosophical ultimate are destined to a continuous disappointment.

# THE EFFECT OF INTELLIGENCE UPON PHONETIC GENERALIZATION[1]

HERBERT A. CARROLL

*University of Minnesota*

The aim of this investigation is to measure, through the medium of spelling, the effect of intelligence upon phonetic generalization. Two approaches are made: 1. Through an analysis of the syllable placement of the errors and of the incidence of errors with respect to the length of words in terms of syllables; 2. Through a phonetic analysis of the misspelled words.

With respect to the first approach, if it is found that bright and dull children do differ in their ability to spell words of varying length, and if they differ as well in the syllable placement of their errors, then intelligence is proved to be a factor. If, in addition, it is learned that such differences grow out of greater or less ability in phonetic generalization, then the conclusion is obvious, i.e., phonetic generalization is affected by intelligence.

With respect to the second approach, if it is found that the bright and dull show marked differences in the way in which they misspell words—that is, if it is found that the bright make many more phonetic misspellings than the dull—then it follows here as well that the ability to generalize phonetically depends upon the intelligence of the child.

## SOURCES OF THE DATA

The subjects of this experiment are fourth and fifth grade pupils in Public School 210, Brooklyn, New York. All of the

[1] The writer is deeply indebted to the Institute of School Experimentation, Teachers College, Columbia, for the privilege of making this study as a part of the research program of Section D, under the immediate direction of Professor Arthur I. Gates and the general supervision of the Director, Professor Otis W. Caldwell.

grades are sectioned. The child's placement status rests primarily upon intelligence, achievement, and teachers' judgments.

Grades IVA, IVB, and VB were chosen. In IVA there were five sections, in IVB, four sections, and in VB four sections. In each of these three grades the brightest and the dullest sections were chosen for this experiment. After some eliminations had been made, because of lack of vital data and because of the desire to have the two groups numerically equated, the final totals were 100 bright pupils and 100 dull pupils. (See table

TABLE 1

*Composition of experimental groups*

| | *N* | MEAN IQ | $\sigma$ | RANGE IN IQ |
|---|---|---|---|---|
| Class 4A: | | | | |
| Bright | 36 | 126.4 | 8.8 | 101–148 |
| Dull | 36 | 88.5 | 9.8 | 66–109 |
| Class 4B: | | | | |
| Bright | 35 | 110.5 | 11.3 | 90–148 |
| Dull | 25 | 89.5 | 13.7 | 59–122 |
| Class 5B: | | | | |
| Bright | 29 | 140.6 | 12.3 | 120–168 |
| Dull | 39 | 96.8 | 11.2 | 66–131 |
| Total: | | | | |
| Bright | 100 | 124.9 ±1.09 | 16.3 | 90–168 |
| Dull | 100 | 92.0 ± .87 | 12.9 | 59–131 |

1.[2]) An average of the IQ's from two group intelligence tests was used: Otis Primary and Haggerty Delta II for IVA and IVB; Haggerty Delta II and National Intelligence Test for VB.

The words chosen for the purposes of this experiment were taken from a list made by Gates. Gates consulted several compilations of the most frequently used words. Having made a composite from these, he turned next to the most popular modern spellers in order to discover the grade placement of such

[2] Throughout this report a minus sign will be used to indicate that the dull rate less than the bright; a plus sign, more.

words. He now had a list of words for all the grades, composed of those most often used by children and placed in these grades where, according to the composite opinion of authors of popular spellers, they belonged.

In order to present to the children a situation which was at least comparatively novel, words were given one year in advance of their present grade status; that is, VA words were given to IVA, VB to IVB, VIB to VB. A factor other than novelty was also considered. To get enough misspellings for experimental purposes, it was necessary to give words considerably in advance of the child's grade placement. This was especially true in the case of the bright children. However, in order to meet the objection that the results would have been quite different had the children been asked to spell words on their own grade level, it was decided to give a sample of 100 such words to 10 children selected at random from each of the six sections. This sample was not given until February, 1930, a half year having elapsed since the main list had been given in September, 1929.

### METHOD OF GIVING

The method of dictating both sets of words was exactly the same. In the main test, 318 words were dictated to IVA, 320 to IVB, and 318 to VB. In the second test, 100 words, chosen at random, were given to 10 children from each of the sections used in the study. With respect to the actual presentation of the words to the children, the following facts are pertinent. Fifty words were given at each sitting, the children meeting for this work once in the morning and once in the afternoon. It required, then, three and one-half days to give the main list. Each teacher dictated the same set of words; that is, the lists were so broken up that when one teacher had dictated a set of fifty words to a bright group, the same teacher dictated the same set of fifty to a dull group. This equated the teacher factor insofar as presentation was concerned. The teacher first pronounced the word, then used it in a sentence, and then pronounced it again, after which it was written by the children.

Approximately 68,000 words were now ready to be classified and analyzed.

### SYLLABLES AND WORD LENGTH

The first phase of the problem has to do with the syllable placement of the error and the incidence of such errors with respect to the syllable length of the word. This task required but few criteria as there was nothing to do so far as the syllable length of the word was concerned but to count the number of times that the children misspelled a one syllable word, a two syllable word, a three syllable word, or a four syllable word. As for the question of deciding in what syllable a certain error appeared, the following short set of rules was worked out progressively as the analysis presented problems to be solved.

*Rules governing analysis of syllable placement of error*

1. Where one letter of a double consonant or a double vowel is omitted at the connecting point between two syllables, the error is said to be in the second of the double. Therefore, the second syllable is incorrect. *Example:* open ess. The error is placed in the last syllable.
2. The omission of a syllable constitutes an error.
3. When a syllable is added, the error is placed in the syllable immediately preceding. *Example:* atherlete. The error is placed in the syllable, ath.
4. When a letter at the connecting point between two syllables is incorrectly doubled, the error is said to be in the first of the two syllables affected. *Example:* addvise. The error is in the first syllable; vise is correct.

### PHONETIC ANALYSIS

The second line of attack was the classification of all the misspelled words into two groups: phonetic and non-phonetic. This division was made on the basis of letter phonetics.

In order to keep subjective influences as infinitesimal a factor as possible, a set of rules was drawn up for the experimenter to follow.

*Rules governing phonetic analysis*

1. Wherever e appears it may either have an e sound or be silent.
2. i substituted for a long e sound is phonetic.
3. f is always accepted as phonetic for v. Example: fefer.
4. t is not phonetic for d. *Exception:* When used as a final letter as in past for passed.
5. k is not phonetic for t.
6. l is called silent when it appears in words which bear a close resemblance to those words in which l is silent, such as could and calf. Example: stuldent.
7. tre is not accepted as phonetic for ter unless it appears as the final syllable of the word.
8. go is not phonetic for quo. Example: quotation.
9. ei and ie may be interchanged.
10. If the second of a double is dropped, the sound remains phonetic.
11. A word is declared phonetic on the basis of its sound as a whole; that is, if any part is spelled non-phonetically, it is placed in the non-phonetic group.

To see if, when these rules were followed by two separate individuals, the results of the classification of misspelled words into phonetic and non-phonetic groups would be similar, two correlations were run. The two judges in this instance were the writer and Miss Harryette Creasy, a graduate student in English at Columbia University, who had previously assisted in an investigation similar to this one. They classified 808 words misspelled by twenty-one children who were selected at random. As a result of this double checking, it was found that one judge placed 328 words in the phonetic group and 480 in the non-phonetic, while the second judge put 338 words in the phonetic group, and 470 in the non-phonetic—a difference of only ten. In order to see how the individuals in the groups fared at the hands of the two judges, a correlation was run with the following results:

| | |
|---|---|
| Phonetic $r$ equals | $.990 \pm .0029$ |
| Non-phonetic $r$ equals | $.997 \pm .00088$ |

Throughout all of the work on phonetic analysis, the dictionary served as the final authority. Whenever there was doubt

as to whether or not the misspelling of a word was phonetic, the possible sounds of the letter or letters concerned were looked up in Webster.

Earlier mention was made of the fact that a sampling of words was given to a few of the children on their own grade level. The results of this sampling were analyzed in the same way as were the words of the main lists.

### RESULTS: WORD AND SYLLABLE PLACEMENT OF ERRORS

Analysis of word and syllable placement of errors showed that although the dull, of course, misspell a great many more one syllable words, they also misspell a great many more two, and three, and four syllable words. The percentage differences here, as well as in the syllable placement of the error, are not strikingly large, though in most cases statistically significant. Each group finds the middle of the word the most difficult to spell, the end second, and the beginning the easiest; and each group finds that length increases difficulty.

### EFFECT OF SYLLABLE LENGTH OF WORD

In order to discover exactly how great such differences were, the following attack on the raw data was made. The ten brightest from each of the bright sections and the ten dullest from each of the dull sections were separated from the main groups. In cases where a member of the selected group had missed a block of words through absence, he was eliminated and the IQ next in order substituted. All words which the child did not attempt to spell were included as misspellings. These two precautions were taken in order that the total number of one, two, three, and four syllable words would be equivalent, respectively, for each intelligence group.

Now it became possible to consider on a percentage basis the misspellings only. That is, the total number of misspelled words of the different syllable lengths was found. On this base the degree of difficulty in terms of percentage was worked out for each of the four lengths considered. (See table 2.) Since the two groups were exactly equated with respect to number of

subjects and number and types of words, the differences between the difficulty percentages indicate clearly the differences between the bright and dull.

Table 2 shows that the dull had greater difficulty than the bright, speaking in terms of percentage, with the one and two syllable words, while the positions of the two groups were reversed with the three and four syllable words. The difference existing with respect to one syllable words is not a significant one, representing a Critical Ratio of but 2.6. The bright, however, do have a significant advantage over the dull in the spelling of two syllable words. The difference is 4.3 with a

TABLE 2

*Comparative percentages of misspellings of words of different lengths by the 10 brightest and the 10 dullest children from each of the three grade groups*

| | BRIGHT | DULL | DIFFERENCE |
|---|---|---|---|
| Number | 30 | 30 | |
| Mean IQ | 137.8 ±1.785 | 80.3 ± .591 | −57.5 ±1.880 |
| $\sigma$ | 14.5 | 4.8 | |
| 1-syllable words | 25.1 ± .755 | 27.3 ± .371 | +2.2 ± .841 |
| 2-syllable words | 49.9 ± .843 | 54.2 ± .418 | +4.3 ± .941 |
| 3-syllable words | 19.6 ± .688 | 15.6 ± .303 | −4.0 ± .752 |
| 4-syllable words | 5.6 ± .310 | 2.9 ± .141 | −2.7 ± .341 |

Critical Ratio of 4.6. In the spelling of three syllable words there is a difference of still greater reliability, this time the dull exceeding the bright. The greatest difference in terms of Critical Ratio exists in the difficulty of four syllable words. It is rather surprising to note that again the bright are the victims, making almost twice as high a percentage of errors as the dull. An explanation of these findings will be essayed later.

## SYLLABLE PLACEMENT OF ERRORS

If the length of the word has differing effects upon bright and dull, it was thought that possibly certain parts of words would prove more difficult for one group than for another. Therefore,

using the same sixty students who furnished the data concerning the comparative effect of word length on difficulty, their errors were analyzed from the point of view of syllable placement. (See table 3.)

A significant difference exists between bright and dull in the relative difficulty of the first and second syllables of two syllable words. The bright find the first syllable easier; the dull the second. The spread of difficulty is much greater with the

TABLE 3

*Comparative percentages of syllable placement of errors made by 10 brightest and 10 dullest children from each of the three grade groups*

| | BRIGHT | DULL | DIFFERENCE |
|---|---|---|---|
| Number | 30 | 30 | |
| Mean IQ | 137.8 ±1.785 | 80.3 ± .591 | −57.5 ±1.880 |
| $\sigma$ | 14.5 | 4.8 | |
| 2-syllable words: | | | |
| First syllable | 35.5 ±1.093 | 43.0 ± .479 | +7.5 ±1.193 |
| Second syllable | 64.5 ±1.093 | 57.0 ± .479 | −7.5 ±1.193 |
| 3-syllable words: | | | |
| First syllable | 14.2 ±1.207 | 23.5 ± .540 | +9.3 ±1.322 |
| Second syllable | 50.9 ±1.727 | 41.4 ± .742 | −9.5 ±1.880 |
| Third syllable | 35.0 ±1.835 | 34.9 ± .715 | −0.1 ±1.973 |
| 4-syllable words: | | | |
| First syllable | 11.7 ±1.855 | 15.6 ±1.147 | +3.9 ±2.181 |
| Second syllable | 29.9 ±2.637 | 27.2 ±1.410 | −2.7 ±2.990 |
| Third syllable | 38.0 ±2.799 | 32.3 ±1.477 | −5.7 ±3.165 |
| Fourth syllable | 21.3 ±2.351 | 25.3 ±1.376 | +4.0 ±2.733 |

bright; that is, there is a difference of 29.0 per cent between the difficulties of the first and second syllables. The dull, on the other hand, present a span of only 14.0 per cent.

Again in the three syllable words a difference in degree of difficulty appears between the two groups in both the first and second syllables. The percentages in the third syllable are almost identical. Once more, however, a greater range is seen to exist between the syllables in the case of the bright.

In no syllable of the four syllable words is there a statistically

significant difference between the two groups, due to the fact that the sampling of four syllable words was so small that the high Probable Error wiped out whatever differences were present.

Briefly summarized, data on the word and syllable placement of errors have yielded the following information: 1. In terms of comparative percentages, the dull have greater difficulty than the bright with one and two syllable words, while the situation is reversed with three and four syllable words; 2. Generally speaking, the bright have less difficulty with the beginning of a word, more with the middle, and less with the end than do the dull; they also show a much greater range of difficulty between syllables.

## RESULTS: PHONETIC ANALYSIS

The primary aim of this investigation was to discover whether or not bright children made more phonetic transfer than the dull in the spelling of unfamiliar words. No conclusions could be drawn with respect to correct spellings, although it might be logically deducted that since the bright are much more successful than the dull in spelling supposedly unfamiliar words, they are utilizing units of past experience; that is, that they are making correct generalizations. However, that can only be assumed.

Though positive transfer can not be directly determined, it is possible through a classification of the misspelled words to learn the amount of negative transfer made. That is, if a child spells *house, h-o-u-s-e,* there is no way of discovering whether he has so spelled it because he has translated the phonetic qualities of the word into those letter counterparts which are correct in this instance, or whether he has previously learned to spell the word. If, however, he spells it *h-o-u-s,* it becomes at least comparatively certain that he is rendering the word phonetically. Other bases of generalization have undoubtedly been at work. For example, the configuration of the misspelling is much the same as the original word. But the outstanding characteristic of the spelling is its phonetic correctness. The phonetic rendi-

tion has led the child into error, to be sure. Perhaps its results are more often faulty than correct. With that this investigation is not concerned. Nevertheless, it should be kept in mind that the writer is measuring negative rather than positive transfer. But if, as Horn remarks, only a very naïve person would assume that simply because there is positive transfer there is no negative, so also may it be said that only a very naïve person would assume that because there is negative transfer there is no positive. In other words, if it can be shown conclusively that children make negative phonetic transfer, it follows that they also make positive transfer, and if the dull make much less negative transfer, they will probably tend also to make much less positive transfer.

TABLE 4

*A comparative phonetic analysis*

| | BRIGHT | DULL | DIFFERENCE |
|---|---|---|---|
| Number of subjects | 100 | 100 | |
| Mean IQ | 124.9 ±1.09 | 92.0 ± .87 | −32.9 ±1.40 |
| $\sigma$ | 16.3 | 12.9 | |
| Total words spelled incorrectly: | | | |
| Number | 6,002 | 18,401 | +12,399 |
| Per cent phonetic | 69.2 ± .401 | 42.6 ± .245 | −26.6 ± .470 |
| Per cent non-phonetic | 30.8 ± .401 | 57.4 ± .245 | +26.6 ± .470 |

All the misspelled words were divided, as was explained earlier, into two groups—phonetic and non-phonetic. The results are very enlightening and furnish the outstanding conclusion of this study. (See table 4.) An examination of table 4 reveals the fact that while the bright erred on the phonetic side in 69.2 per cent of their misspelled words, the dull made such generalizations in only 42.6 per cent of the cases,—a difference of 26.6 per cent. When it is considered that the Probable Error of this difference is only .470, resulting in a Critical Ratio of 37, it becomes obvious that the bright and dull differ sharply in their capacity to generalize phonetically. The bright have made a

transfer in over two-thirds of their misspellings, while the dull saw identical elements in considerably less than half.

A random selection of the children were now given a sampling of words on their own grade level. The results are striking. While the sixty subjects phonetically misspelled 48.1 per cent out of their total number of misspelled words when working with words one year in advance of their grade status, they phonetically misspelled 48.5 per cent of the words given on their own grade level—a difference of 0.4 per cent. (See table 5.) When it is observed that the Probable Error is 1.42, any actual difference disappears. Therefore it seems safe to conclude that had the children been tested solely with words on their own grade level, the results growing out of this phase of the investigation would not have been in any way affected.

TABLE 5

*A comparative phonetic analysis of words given on subjects' grade level and words given one year in advance*

| WORDS | NUMBER OF SUBJECTS | MEAN IQ | σ | TOTAL MISSPELLED WORDS | | |
|---|---|---|---|---|---|---|
| | | | | Number | Phonetic | Non-phonetic |
| | | | | | *per cent* | *per cent* |
| One year advance. | 60 | 109.6±2.30 | 23.4 | 7,113 | 48.1± .590 | 51.9± .590 |
| Grade level..... | 60 | 109.6±2.30 | 23.4 | 1,493 | 48.5±1.290 | 51.5±1.290 |
| Difference..... | | | | −5,620 | +0.4±1.42 | −0.4±1.42 |

## INTERPRETATION

The results having been stated, it is now time to attempt an explanation of the differences found between the bright and dull subjects. Interpretation of findings is always open to error, but in this instance it seems to be rather clear-cut.

### WORD LENGTH AND SYLLABLE PLACEMENT

According to the data previously presented, significant differences exist between the bright and dull in their ability to spell

words of varying syllable length. The bright, it was found, have less difficulty with two syllable words, and more with three and four syllable words. At first glance this would seem to be a rather surprising conclusion, for it might be supposed that the longer and more complicated the word the more likely the dull would be to misspell it. Such is the case—but the bright are even more likely.

Differences in ability to generalize phonetically appear to be at the root of this situation. The longer the word, the more opportunity for negative phonetic transfer. Assuming that the dull child has a tendency to learn to spell by rote, it follows that he is not so prone to be as seriously affected by the length of the word as is the bright child who depends more upon his ability to generalize. The dull child knows the word or he does not know it. The bright child, on the other hand, if faced with the problem of spelling a one or two syllable word with which he is unfamiliar, stands a fairly good chance of hitting upon the correct phonetic translation. When, however, the word to be spelled is made up of three or four syllables the opportunity for him to go astray phonetically is considerably greater. Hence, comparatively speaking, he finds the increase in difficulty of the longer words over the shorter somewhat greater than does the dull child.

The above line of reasoning is borne out to some extent by the findings with respect to the syllable placement of the error. As was stated earlier, it was found that the bright have a smaller percentage of difficulty with the beginning of the word and a greater with the middle and the end. The result of this is that the bright also show a much wider range of per cent between the first and the last syllables of a word than do the dull. The rather obvious conclusion to be drawn is that when the dull miss a word they are more likely than the bright to miss the whole thing; that is, if it is a three syllable word, to err in all three syllables. The bright, on the other hand, show a different distribution of mistakes. In their attempt to spell a word phonetically, they may err in a single syllable but not in every one. Hence, the greater spread. As an example, take the word

*government*. The bright child, spelling the word, g-o-v-i-r-n-m-e-n-t, errs only in the second syllable; the dull child, spelling it g-e-v-e-m-n-o-s-t, errs in all three. His non-phonetic rendering has resulted in an even distribution of errors.

## PHONETIC ANALYSIS

The data resulting from the classification of all misspelled words into phonetic and non-phonetic groups has already been presented. It needs but little interpretation. Given the same words, a group of bright children will come much nearer to making phonetic translations than will a group of dull children. The reason for this evidently lies in the fact that the bright child possesses greater ability in recognizing phonetic elements in the new words which are identical with those which he has previously used. He is asked to spell the unfamiliar word *conductor*. Immediately he recognizes certain sounds such as *on* and *or*. He remembers perhaps that the *on* sound was spelled *o-n* in *conduct*, and the *or* sound, *e-r*, in *order*. He succeeds in making a positive transfer of the sound *on*, but spells the *or*, *er*. The latter transfer is correct phonetically, but negative, nevertheless. Hence though he has spelled his word incorrectly, he has generalized soundly. The dull child, making comparatively little transfer, spells the word *condimslur*, which is, of course, non-phonetic. Such appears to be the explanation of the situation found when the data were treated from this point of view.

## CONCLUSIONS

1. Bright and dull children are affected differently by the length of the word and by the position of the syllable.

a. The bright have a lower percentage of difficulty with the shorter words and a higher with the longer words than the dull.

b. The bright have a lower percentage of difficulty with the first part of the word and a higher with the middle and last parts.

2. A phonetic-nonphonetic classification of the misspelled words shows that the bright are much more likely than the dull to err phonetically.

3. The psychological explanation of each of these differences appears to lie in the marked superiority of the bright over the dull in phonetic generalization ability.

# A STUDY OF THE EMOTIONS IN PSYCHOPATHIC PERSONALITIES[1]

## Based on the Pressey X-O Tests—Form B

ELMA OLSON

*Yale University*

### I. INTRODUCTION

As the study of human activity and conduct has developed and formulations of principles and laws which underlie man's reactions have been attempted, the significance of the part played by the emotions has come to occupy an increasingly important place. Especially is this true in the field of psychopathology where the reshaping and rebalancing of personality often depend upon the finding of situations connected with an emotion, or upon determining whether there is an emotion where normally there should be one, or if there is an unusual deviation of emotion.

The classification of original emotional patterns are many and varied but the portions of any pattern reaction in emotion as given by Watson (1) are explicit and implicit. The explicit portions, those observable, are usually the least important and may be studied with scientific accuracy by systematic observation. Explicit emotional manifestation may disappear through voluntary effort on the part of the subject by practising deceit, concealment, or repression, but although overt action is inhibited, implicit activity is present and may be stimulated to greater force by the inhibition of explicit response.

[1] This study was made in 1923. Because of repeated inquiries and requests for publication the material has been condensed and offered for that purpose. Though the nomenclature or classification of this particular group of deviates since has been questioned the original diagnostic term is retained for this article.

Several methods are in use by means of which the implicit side of emotion may be detected:

1. The word reaction method (2).
2. Dream study (3).
3. The study of slips of word or pen, over and under reactions, bodily postures and attitudes, etc. (4).
4. The determination of increased blood sugar after significant stimuli (5).
5. Psychogalvanic reflex (6).
6. Expressive methods—respiratory and vasomotor changes (7).
7. Automatic writing (8).
8. Emotional questionnaires—as Woodworth's (9).
9. Emotional tests—as Pressey's (10).

## II. PROBLEM

### *A. General statement*

Twenty-four psychopathic personalities were given the Pressey X-O Tests Form B.[2] The chief points studied were:

1. Individual differences.
2. Sex differences.
3. Total emotionality.
4. Deviation from the modal word.
5. Significant test results as compared to personal case history.

Of the twenty-four subjects tested twelve were male and twelve were female. The age range of the males was sixteen to thirty-four years inclusive with an average of 27.7 years and

[2] For description of this test and Dr. Pressey's early work in this field see:

Pressey, S. L. and L. W. "Cross Out Tests, with Suggestions as to a Group Scale of the Emotions," Journal of Applied Psychology, Volume III, June, 1919, pp. 138–150.

Pressey, S. L. and Chambers, O. R. "First Revision of a Group Scale Designed for Investigating the Emotions with Tentative Norms," Journal of Applied Psychology, Volume IV, March, 1920, pp. 97–102.

Pressey, S. L. "A Group Scale for Investigating the Emotions," Journal of Abnormal Psychology, April, 1921, pp. 55–64.

that of the females was eighteen to thirty-seven years with an average of 24.9 years.

The original intention was to test a greater number of subjects, but among the resident population of Manhattan State Hospital as well as among those of the parole system, only twenty-four available were found to meet the requirements which are:

1. Chronological age range, 15–40 years.
2. Mental age range, 12–16 years.
3. Clear diagnosis. Only uncolored pictures were selected. Any question of complicating factors as epilepsy, organic brain disease, or pronounced mental deficiency in the diagnosis of a psychopathic personality ruled out the subject. Intelligence ratings were obtained for most of the subjects and although two subjects approached the border-line case, they were used because of dearth of material. Two were classed as superior adults. The Binet–Simon, Terman revision, was the test used in all cases.
4. No psychosis. Although all subjects, except one, were found to have a psychosis on commitment, they were not given the test until recovered from the episode. Most of the tests were given on the convalescent service immediately prior to patient's parole; several were given to patients during the parole period of six months to one year and in one case the patient had been discharged from parole six months.

### *B. Choice of subjects*

Psychopathic personalities were chosen for this study because it would seem that in individuals whose departures from the norm are expressed mainly in the character and degree of their emotional and volitional reactions, significant deviations of the emotions and sentiments would be observed in the test results.[3]

[3] For other studies based on this test see:
Chambers, O. R. "Character Trait Tests and the Prognosis of College Achievement," The Journal of Abnormal and Social Psychology, October, 1925, pp. 303–311.

### *C. Choice of test*

Pressey's X-O Tests were chosen for the study for the following reasons:

1. The general plan of the tests seems to offer special opportunities for expression of abnormal tendencies.
2. The test material is greatly condensed Although a 600 item examination, the effort and time required of the subject is comparatively small. Considering the difficulties of continuous, purposeful concentration on the part of these personalities, minimum time and effort are favorable qualities in a test applied to them.

### *D. Description of subjects*

The designation, psychopathic personality is used as defined in the "Statistical Guide" of New York State Hospital Commission (11) and applied to the diagnoses in the Manhattan State Hospital. These pathological personalities are more fully described by Rosanoff (12), Visher (13), Tredgold (14), Diefendorf (15), Salmon (16), Glueck (17), Healy (18), Davenport (19), and Krafft-Ebing (20).

### *E. Method used*

The tests were given individually and personally. The time element was not emphasized to the subject in order that his response would not be affected, but in each case was recorded by the examiner. An attempt was made to classify the subjects in terms of resistance as follows:

1. Eager to take test.
2. Willing to take test.
3. Indifferent.
4. Agrees but shows marked resistance.
5. Refuses to take test.

---

Tjaden, J. C. "Emotional Reactions of Delinquent Boys of Superior Intelligence Compared with those of College Students," Journal of Abnormal and Social Psychology, July, 1926, pp. 192–197.

Guilford, J. P. "An Attempted Study of Emotional Tendencies in Criminals," Journal of Abnormal and Social Psychology, October, 1926, pp. 240–244.

## III. RESULTS

### *A. Norm used*

The results obtained were compared to a tentative norm based on data from114 college students, 58 women and 56 men, which was the latest material in available form at the time these tests were given. An attempt is made to tabulate the data in such a way that further comparison with a new norm may be simple. The present (norm) median is placed at the head of each column of figures to which it is related and the word schemes of the test are given separately as are also the emotionality and deviation of each test. Emotionality or affectivity always refers to words crossed out and deviation or idiosyncrasy to words circled. Throughout the tabulation the case numbers remain constant.

### *B. Individual differences*

*Test I.* The affectivity to words of unpleasantness varies from 25 (words marked) to 69. The total number words below the median, 41 (of normals), is 243 as compared to 874 above; or, 24+ per cent (9 subjects) of the total response fails to reach the median. The total number marked is 1117 with the median 47.5. The words marked in order of their greatest affectivity are: suspicion, 302; disgust, 297; fear, 291; and sex, 223. The order of the norm is disgust, sex, suspicion, and fear. Of the 593 words circled (those most unpleasant) the order is as follows: fear, 161; disgust, 156; suspicion, 143; and sex, 133.

As noted above the suspicion words elicited the greatest response with a total of 302 and a range of 2 to 22 words marked. With a (norm) median of 10.1, 20+ per cent (9 subjects) are below and 79+ per cent (15 subjects), above the norm, the median number of words marked being 12.6. This affectivity to words of suspicion is significant. The disgust words total 297 and the range of marked words is 5 to 19 with 59+ per cent (17 subjects) below the median of the norm, 14.2, and 40+ per cent (7 subjects), above. The median number of words is 12.5. The total number of fear words is 291 with marked words rang-

ing from 5 to 20. With the median of 8.6, 17+ per cent of the words (8 subjects) are below and 82+ per cent (16 subjects) are above it. The median marked is 13.2. There is a marked drop in the sex words which total 223 with a median of 9.7 as compared to 13 in the norm; 81+ per cent (21 subjects) are below this standard and 13+ per cent (2 subjects) are above with one subject at the norm. Only 4 jokers were marked; in no case was more than one joker marked by a subject.

Some of the words most commonly marked as unpleasant by the 24 subjects are as follows:

| WORD | NUMBER MARKED | NUMBER CIRCLED |
|---|---|---|
| insanity | 21 | 14 |
| crazy | 19 | 10 |
| persecute | 18 | 11 |
| worry | 16 | 4 |
| nervous | 13 | 7 |

The modal choice *cruel* was marked in 22 cases and circled 21 times. The deviation has the wide range of 5 to 22 words (other than the modal choice) circled. The total is 273 with a median of 11.5 words per subject as compared to the (norm) median of 11.

*Test II.* The score in richness of emotional association shows 1101 words crossed out with a median of 40.6 as compared to the norm median 55. The range of words crossed out is 27 to 95 and those below the median are 66+ per cent (19 subjects), the remaining 33+ per cent (5 subjects), making the high average of 74 words each. The word range in deviation is 5 to 19 non-modal words circled with a total of 271 and with a median of 11.5 words (norm 10). This deviation from the modal choice is not attributed to lack of understanding on the part of the subject but appears significant in suggesting peculiar emotional idiosyncrasies in unusual word associations.

Some of the common but significant variations are noted in reference to the words *family* and *home*. Sixteen of the 24 subjects marked the word *bitter* as associated in their minds

TABLE 1

*Individual differences*

| ALL TESTS | | | | | TEST I | | | | | | | TEST II | | TEST III | | TEST IV | | | | | TOTAL | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Case | Sex | Age | Time | Res. | Disgust med. 14.2 | Fear med. 8.6 | Sex med. 13 | Suspicion med. 10.1 | Joker med. .3 | Total emot. med. 41 | Dev. med. 11 | Emot. med. 55 | Dev. med. 10 | Emot. med. 73 | Dev. med. 13 | Paranoid med. 9.3 | Neurotic med. 9.6 | Shut-in med. 9.7 | Melancholic med. 11.1 | Hypochondriacal med. 9.8 | Emot. med. 46 | Dev. 15 |
| 1 | F. | 19 | 30 | 2 | 14 | 5 | 4 | 2 | 0 | 25 | 9 | 27 | 11 | 55 | 12 | 4 | 6 | 2 | 10 | 4 | 26 | 15 |
| 2 | M. | 34 | 60 | 2 | 5 | 5 | 7 | 8 | 0 | 25 | 12 | 75 | 10 | 89 | 11 | 13 | 8 | 10 | 10 | 6 | 47 | 15 |
| 3 | M. | 23 | 25 | 2 | 9 | 6 | 8 | 5 | 0 | 28 | 15 | 40 | 19 | 42 | 19 | 8 | 7 | 1 | 6 | 11 | 34 | 17 |
| 4 | M. | 16 | 40 | 2 | 11 | 8 | 3 | 8 | 0 | 30 | 12 | 47 | 13 | 64 | 16 | 3 | 7 | 5 | 8 | 15 | 38 | 16 |
| 5 | F. | 27 | 60 | 3 | 9 | 5 | 10 | 7 | 0 | 31 | 8 | 40 | 14 | 48 | 14 | 5 | 7 | 4 | 9 | 13 | 38 | 17 |
| 6 | M. | 17 | 50 | 2 | 9 | 13 | 5 | 5 | 0 | 32 | 13 | 31 | 5 | 47 | 15 | 5 | 6 | 11 | 10 | 8 | 40 | 21 |
| 7 | M. | 28 | 65 | 4 | 6 | 8 | 8 | 10 | 0 | 32 | 11 | 50 | 10 | 58 | 15 | 13 | 14 | 14 | 12 | 17 | 70 | 11 |
| 8 | M. | 31 | 75 | 3 | 9 | 12 | 8 | 9 | 0 | 38 | 11 | 30 | 13 | 53 | 11 | 4 | 5 | 1 | 9 | 13 | 32 | 18 |
| 9 | M. | 22 | 50 | 3 | 9 | 13 | 9 | 9 | 0 | 40 | 13 | 30 | 11 | 75 | 19 | 7 | 4 | 1 | 12 | 9 | 33 | 17 |
| 10 | F. | 21 | 30 | 4 | 11 | 8 | 11 | 12 | 0 | 42 | 5 | 34 | 7 | 81 | 8 | 5 | 12 | 9 | 12 | 13 | 51 | 15 |
| 11 | M. | 17 | 30 | 2 | 11 | 14 | 10 | 11 | 0 | 46 | 14 | 40 | 11 | 61 | 17 | 8 | 8 | 13 | 8 | 18 | 55 | 19 |
| 12 | M. | 18 | 40 | 2 | 13 | 12 | 9 | 12 | 1 | 47 | 10 | 48 | 15 | 72 | 13 | 10 | 6 | 1 | 6 | 6 | 29 | 12 |
| 13 | F. | 30 | 30 | 2 | 16 | 6 | 12 | 12 | 1 | 47 | 10 | 59 | 11 | 50 | 10 | 7 | 6 | 11 | 5 | 16 | 45 | 20 |
| 14 | M. | 23 | 60 | 4 | 12 | 13 | 10 | 13 | 0 | 48 | 13 | 31 | 6 | 70 | 15 | 6 | 6 | 7 | 10 | 9 | 38 | 15 |
| 15 | F. | 30 | 50 | 2 | 14 | 13 | 6 | 17 | 0 | 50 | 8 | 39 | 8 | 97 | 15 | 5 | 9 | 4 | 9 | 14 | 41 | 14 |
| 16 | F. | 19 | 45 | 1 | 15 | 13 | 11 | 13 | 0 | 52 | 9 | 80 | 13 | 82 | 16 | 8 | 16 | 12 | 12 | 11 | 59 | 16 |
| 17 | F. | 30 | 45 | 2 | 12 | 10 | 9 | 22 | 1 | 54 | 11 | 42 | 9 | 70 | 17 | 7 | 5 | 5 | 5 | 11 | 34 | 11 |

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 18 | F. | 24 | 40 | 2 | 10 | 17 | 12 | 19 | 0 | 58 | 9 | 48 | 11 | 101 | 18 | 8 | 3 | 7 | 5 | 2 | 25 | 21 |
| 19 | F. | 37 | 45 | 2 | 18 | 20 | 9 | 13 | 0 | 60 | 22 | 61 | 19 | 65 | 10 | 4 | 8 | 4 | 8 | 9 | 33 | 16 |
| 20 | F. | 23 | 30 | 2 | 14 | 16 | 15 | 19 | 0 | 64 | 8 | 95 | 10 | 75 | 9 | 17 | 17 | 16 | 20 | 24 | 94 | 17 |
| 21 | M. | 28 | 50 | 3 | 17 | 19 | 10 | 18 | 1 | 65 | 14 | 34 | 10 | 81 | 20 | 5 | 14 | 3 | 12 | 19 | 53 | 21 |
| 22 | M. | 20 | 120 | 4 | 19 | 18 | 9 | 20 | 0 | 66 | 15 | 38 | 9 | 51 | 20 | 5 | 10 | 6 | 5 | 3 | 29 | 17 |
| 23 | F. | 18 | 60 | 2 | 18 | 19 | 13 | 18 | 0 | 68 | 11 | 48 | 12 | 71 | 13 | 11 | 10 | 10 | 12 | 14 | 57 | 13 |
| 24 | F. | 21 | 45 | 1 | 16 | 18 | 15 | 20 | 0 | 69 | 10 | 34 | 14 | 95 | 15 | 4 | 4 | 2 | 9 | 5 | 24 | 18 |
| Total..... | | 576 | 1175 | | 297 | 291 | 223 | 302 | 4 | 1117 | 273 | 1101 | 271 | 1653 | 348 | 172 | 198 | 159 | 225 | 270 | 1025 | 392 |
| Med..... | | 23.3 | 45 | 2 | 12.5 | 13.2 | 9.7 | 12.6 | .25 | 47.5 | 11.5 | 40.62 | 11.5 | 70.5 | 15.4 | 6.62 | 7.62 | 5.5 | 9.7 | 11.62 | 38.6 | 16.9 |

Res. = resistance; med. = median of norm; emot. = words marked; dev. = words circled.

with the word *family* and ten of these were circled. Also, *home* was marked by 5 subjects in association with *anger*, 2 of them circling the word; all but one of these gave the *family-bitter* association. This finding is not a startling one when the home situation of psychopaths is studied. Because these individuals are constantly at odds with their environments it might be expected that the main concentration of their adverse sentiments and paranoid attitudes would center in the home and immediate family where the conflicts and misunderstandings become most severe in the necessarily close relationships. Suggestions of feeling of discouragement and failure are found in 9 associations of *die* with the word *wish*, 3 of them circled. Also, *welcome* is associated with *death* 7 times, 5 of them being circled; and of the seven subjects making the *death-welcome* association, four also associated *die* with *wish*. The number associating *hopeless* with *death* are fourteen, eleven using the circle and of these fourteen, all but one are represented in the *wish-die* and *death-welcome* associations. Fifteen made the *sleep-worry* association and five, the *dream-floating* association.

*Test III.* In contrast to the preceding tests, this ethical discrimination test shows the greatest affective response in total number of words marked. Sixteen hundred fifty-three words are crossed out with a median of 70.5 which is below the norm median of 73. The word range is 42 to 101 and the number of words below the median are 53+ per cent (15 subjects) with the remaining 9 subjects making the score of 46+ per cent words each. The deviation shows a word range of 8 to 20 non-modal words circled and totals 348 with a median of 15.4 (norm 13), which is a larger deviation than in either of the former tests. As this test may also be called a test to measure conformity, a deviation would be in keeping with the psychopath who is noted for his non-conformity to ethical standards.

The non-modal words most commonly marked are *cruel* crossed by 22 subjects and circled by 10 and *persecute* marked by 18 and circled by 7; these may be suggestive of paranoid trends. It is interesting to note that *insane* is considered to be wrong by 14 subjects and circled by 3. Also that lines 20 and 21

appear to be most puzzling; line 21 would often be left blank unless the subject was urged to comply with the directions. The words circled in this line are: broker—9; judge—4; millionaire—4; priest—4; lawyer—1. Two subjects failed to mark any word in the line.

*Test IV.* The anxiety tendency ranges from 24 to 94 with a total of 1024 and a median of 38.6 which is below the median 46. The percentage of words below the median is 52+ per cent (16 subjects). The words marked in order of their greatest number are hypochondriacal, 270; melancholic, 225; neurotic, 198; paranoid, 172; and shut-in, 159; as compared to the order of the norm: melancholic, hypochondriacal, shut-in, neurotic, and paranoid. Significant non-modal words marked commonly as objects of worry are:

| WORD | NUMBER MARKED | NUMBER CIRCLED |
|---|---|---|
| impulses | 7 | 9 |
| persecution | 10 | 13 |
| nervous-breakdown | 17 | 11 |
| insanity | 15 | 4 |

The modal word *nervousness* is marked by all but two and is circled by seventeen subjects.

The melancholic words total 225 and the median is 9.7 which is slightly below the norm median 11.1. The range of marked words is 5 to 20 with 71+ per cent (17 subjects) below the median. The total number of hypochondriacal words is 270 with a median of 11.6 which exceeds the norm median 9.8. The word range is 2 to 24 with 77+ per cent (14 subjects) above the median. The neurotic words marked total 198 with a median of 7.6 which falls below the norm median, 9.6. The word range is 3 to 17, 53+ per cent (17 subjects) being below the median. The paranoid words follow with a total of 172 and a median of 6.6 which is below the norm of 9.3. The word range is 3 to 17 and 62+ per cent (19 subjects) are below the median. The shut-in words make the smallest total, 159, in Test IV

and the median 5.5 shows the greatest variation from the norm median, 9.7, of all groups in this test. The word range is 1 to 16 with 38+ per cent (16 subjects) below the median.

The total deviation of 392 words is greater than that of the other tests. The word range is 11 to 21 non-modal words circled, with the median deviation of 16.9; the norm median is 15. This high deviation in emotional idiosyncrasy might suggest the existence of a perverse state of feeling, temperament, or disposition. Bitterness, cynicism, and neurotic manifestations frequently result from emotional instability and maladjustment and such traits seem especially prominent in the results of this test.

*Resistance.* The resistance range is 1 to 4 inclusive. Two subjects are classed as eager to take the test, fifteen as willing, three as indifferent, and four as agreeing but showing marked resistance to the words.

*Time.* The time required by the subjects for the total test ranges from thirty minutes to two hours with an average of 41.8 minutes. Time is not correlative with resistance but appears rather to be an index of the individual's ability to concentrate on his task and of his quickness of judgment.

### *C. Sex differences*

*Test I.* The affectivity to unpleasant words is greater for the women than for the men throughout the test, the total being 620 and 497 words respectively; the median 53 and 39 as compared to the norm median of 41. Two men and two women each marked one joker. The order of words marked by the men in order of number are: fear—141; disgust—130; suspicion—128; and sex—96. The order for the women is: suspicion—174; disgust—167; fear—150; and sex—127. The order of the norm is sex, disgust, suspicion, and fear. The affect expressed by each sex according to greatest number of words marked in each group is as follows:

| | DISGUST | FEAR | SEX | SUSPICION |
|---|---|---|---|---|
| Male | 3 | 6 | 0 | 3 |
| Female | 3 | 3 | 1 | 5 |

The words most commonly marked according to sex, are:

| | INSANITY | CRAZY | PERSE-CUTE | WORRY | NERVOUS |
|---|---|---|---|---|---|
| Male | 11 | 10 | 8 | 7 | 5 |
| Female | 10 | 9 | 10 | 9 | 8 |

The modal word *cruel* was marked by 12 men and circled in each case and 9 women marked it, nine circling it. The deviation of the men, 153 words, is greater than that of the women, 120. The median is 13.3 and 9.6 words respectively. The norm is 11.

*Test II.* In richness of emotional association, both sexes fail to reach the median. The women show a greater response of 607 words as compared to 494 words marked by the men, with the median of 45 and 39; the norm median is 55. In deviation the women scored 139 words and the men 132 with the median of 11.1 and 10.5 words respectively. The significant word associations are grouped according to sex:

| | BITTER-FAMILY | | ANGER-HOME | | DEATH-HOPELESS | |
|---|---|---|---|---|---|---|
| | Marked | Circled | Marked | Circled | Marked | Circled |
| Male | 9 | 7 | 2 | 1 | 9 | 5 |
| Female | 7 | 3 | 3 | 1 | 11 | 6 |

*Test III.* The women show a greater conformity to the ethical discrimination test than do the men. The total response by the women is 890 and 763 by the men, the women making a median of 73 in comparison to 62.5 for the men; the median is 73. In deviation score the women also show more conformity as they circle 157 words compared to 191 circled by the men.

TABLE 2

*Sex differences*

Test I

| SEX | MED. AGE | MED. RESIS | MED. TIME | | DISGUST MED. 14.2 | FEAR MED. 8.6 | SEX MED. 13 | SUSPICION MED. 10.1 | JOKER MED. 3 | EMOT. MED. 41 | DEV. MED. 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Male | 22.6 | 2.5 | 50 | Total... | 130 | 141 | 96 | 128 | 2 | 497 | 153 |
| | | | | Med.... | 10.5 | 12.9 | 9 | 9.8 | .2 | 39 | 13.3 |
| Female | 23.5 | 2.5 | 45 | Total... | 167 | 150 | 127 | 174 | 2 | 620 | 120 |
| | | | | Med.... | 14.6 | 13.5 | 11.5 | 15 | .2 | 53 | 9.62 |

Test II

| | | EMOT. MED. 53 | DEV. MED. 8 |
|---|---|---|---|
| Male | Total... | 494 | 132 |
| | Med.... | 39 | 10.5 |
| Female | Total... | 607 | 139 |
| | Med.... | 45 | 11.1 |

Test III

| | | EMOT. MED. 73 | DEV. MED. 13 |
|---|---|---|---|
| Male | Total... | 763 | 195 |
| | Med.... | 62.5 | 15.8 |
| Female | Total... | 890 | 154 |
| | Med.... | 73 | 13.5 |

Test IV

| | | PARANOID MED. 9.3 | NEUROTIC MED. 9.6 | SHUT-IN MED. 9.7 | MELANCHOLY MED. 11.1 | HYPOCHONDRIACAL MED. 9.3 | EMOT. MED. 46 | DEV. MED. 15 |
|---|---|---|---|---|---|---|---|---|
| Male | Total.... | 87 | 95 | 73 | 109 | 134 | 498 | 199 |
| | Med..... | 6.5 | 7.5 | 5.5 | 9.5 | 10.3 | 38.5 | 17.3 |
| Female | Total.... | 85 | 103 | 86 | 116 | 136 | 526 | 193 |
| | Med..... | 6.04 | 7.5 | 6 | 9.6 | 12 | 39.5 | 16.5 |

The median is 13.5 words for the women and 15.8 for the men; the norm is 13. In the non-modal words circled there appears to be practically no sex difference. *Cruel* is marked by 11 of each sex and circled by 5 of each sex. Nine of each sex crossed out *persecute*, 3 men and 4 women using the circle. Seven of each sex considered *insane* to be a worry, 2 men and 1 woman circling the word.

*Test IV.* Both sexes fail to reach the norm in response to anxiety tendency in which the median is 46 words. The women make a slightly nearer approach with a median of 39.5 than the men with a median of 38.5. The total emotionality for the women is 526 and for the men is 498. The words marked by the men in order of number are: hypochondriacal—134; melancholy—109; neurotic—95; paranoid—87; and shut-in—73. The order for the women is: hypochondriacal—136; melancholy—116; neurotic—103; shut-in—86; and paranoid—85. According to the norm the order is melancholy, hypochondriacal, shut-in, neurotic, and paranoid. The greatest affect expressed by each sex according to greatest number of words in each group is as follows:

| | PARANOID | NEUROTIC | SHUT-IN | MELANCHOLY | HYPOCHONDRIACAL |
|---|---|---|---|---|---|
| Male | 2 | 1 | 1 | 2 | 6 |
| Female | 1 | 1 | 0 | 2 | 8 |

The non-modal words are distributed according to sex:

| | IMPULSES | | PERSECUTION | | INSANITY | | NERVOUS BREAKDOWN | |
|---|---|---|---|---|---|---|---|---|
| | Marked | Circled | Marked | Circled | Marked | Circled | Marked | Circled |
| Male | 2 | 2 | 7 | 6 | 8 | 6 | 7 | 5 |
| Female | 5 | 4 | 7 | 3 | 7 | 5 | 10 | 8 |

The modal words *nervous* was marked by 12 men and 10 women and circled by 9 men and 8 women. The greatest deviation

in the four tests is found here. The total non-modal words circled by the men is 199 with a median of 17.3 compared to the total of 193 with a median of 16.5 for the women.

*Resistance.* Resistance according to sex is distributed as follows:

| | CLASS 1 | CLASS 2 | CLASS 3 | CLASS 4 | CLASS 5 |
|---|---|---|---|---|---|
| Male | 0 | 6 | 3 | 3 | 0 |
| Female | 2 | 8 | 3 | 1 | 0 |

*Time.* The time range for the men is 30 minutes to 2 hours with an average of 54.5. For the women, the range is 30 minutes to 1 hour with an average of 42.5 minutes. For the men the total time is 10 hours and 55 minutes and for the women 8 hours and 30 minutes.

## IV. CONCLUSIONS

### *A. Individual differences*

1. There is great variation of individual response in all tests.
2. Words of suspicion were found most unpleasant and words of sex, least.
3. These subjects were low in richness of emotional association; attitudes of bitterness, discouragement, failure, and cynicism were marked.
4. The greatest deviation occurred in Test III indicating a failure to conform to ethical standards.
5. Deviation in emotional idiosyncrasy is high.
6. The individual's emotional response compares favorably with his emotional make-up as recorded in his psychiatric history.[4]

### *B. Sex differences*

1. The women showed a greater response to words of unpleasantness. The men's greatest affective response was to words of fear and the women's, to words of suspicion.

[4] In the original study detailed comparisons were made in five cases of test results and case record.

2. The women indicated a greater richness of emotional association.

3. The women show a greater conformity in ethical discrimination.

4. The men and women followed with one exception the same order in response to anxiety words though this was not the order of the norm. The exception indicated that the men's lowest response was to the shut-in words, whereas the women's lowest response was to the paranoid words.

## REFERENCES

(1) Watson, J. B.: Psychology from the Standpoint of a Behavorist, J. B. Lippincott & Co., Philadelphia, 1919, p. 207.

(2) Jung, C. G. (Hrag): Diagnostiche Assoziations-studien. Bertrage zur experimentellan Psychopathologie, 2. Bd., Leipsig; Barth, 1910.

(3) Freud, S. (Brill): The Interpretation of Dreams, Ed. 3, Allen, London, 1913.

(4) Freud, S. (Brill): Psychopathology of Every-Day Life, Macmillan Co., N. Y., 1914.

(5) Cannon, W. B.: Bodily Changes in Pain, Hunger, Fear, and Rage, Appleton & Co., N. Y., 1920, p. 120.

(6) Waller, A. D.: The Galvanometric Measurements of "Emotive" Physiological Changes, Proc. Roy. Soc., Part B, 1918, Vol. 90, p. 214.

(7) Peterson, F., and Jung, C. J.: Psycho-physical Investigations with the Galvonometer and Pneumograph in Normal and Insane Individuals, Brain, Vol. 30, p. 153.

(8) Prince, M.: The Dissociation of a Personality, Longmans, Green & Co., N. Y., 1906, p. 460.

(9) Franz, S. I.: Handbook of Mental Examination Methods, 2nd ed. rev. and enl., Macmillan Co., N. Y., 1919, p. 171.

(10) Pressey, S. L.: A Group Scale for Investigating the Emotions, J. of Abn. Psychol. and Soc. Psychol., April, 1921, Vol. 16, p. 55.

(11) Statistical Guide, State of N. Y. State Hosp. Commission, State Hospital Press, Utica, N. Y., 1921, p. 24.

(12) Rosanoff, A. J.: Manual of Psychiatry, Wiley & Sons, Inc., N. Y., 1920, p. 215.

(13) Visher, J. W.: A Study in Constitutional Psychopathic Inferiority, Mental Hygiene, Oct., 1922, Vol. 6, p. 729.

(14) Tredgold, A. F.: Mental Deficiency, Ed., 3, Wm. Wood & Co., N. Y., 1920.

(15) Diefendorf, A. R.: Clinical Psychiatry, Ed. 2, Macmillan Co., N. Y., 1921.

(16) Salmon, T. W.: Some New Problem for Psychiatric Research in Delinquency, Mental Hygiene, Jan., 1920, Vol. 4, p. 37.

(17) Glueck, B.: Recent Progress in Determining the Nature of Crime and the Characteristics of Criminals, Reprint No. 116 of Addresses of the Nat'l. Conf. of Social Work, 1917, p. 10.

(18) Healy, W. and M. T.: Pathological Lying; Accusation, and Swindling, Criminal Science, Monog. No. V, Boston, Little, Brown, 1915.

(19) Davenport, C. B.: The Feebly Inhibited: Nomadism, or the Wandering Impulse, with special reference to heredity, Carnegie Inst. of Washington, 1915.

(20) Krafft-Ebing, R. V. (Rebmen): Psychopathia Sexualis, Eng. Adapt, of 12th Ger. ed., Medical Art Agency, N. Y.

# PUNCHING PSYCHOLOGICAL AND SOCIOLOGICAL DATA ON HOLLERITH CARDS

ALICE M. LEAHY

*University of Minnesota*[1]

The establishment of the Hollerith equipment in a central University plant introduces several administrative problems. How to gauge the time needed by the various pieces of research in order to anticipate the assignment of the machines is an immediate question. Card sorting, counting and tabulating are *ipso facto* timed powers of the machines. As soon as the total quantity of the data and the number of variables that are to enter into its calculations are known the time necessary to complete the job can be fairly accurately declared. Card punching and verifying, however, present problems involving time that can be equated only by a knowledge of the set-up of the investigation and the physical conditions that prevail in the research laboratory.

In the publications of Mendenhall and Warren[2] it is reported that 150 to 200, 45-column cards can be punched per hour, or about 1000 a day. This estimate was made by punching cards from secondary data sheets on which appeared only the number-symbols to be punched on the Hollerith card. Since much of the research in education, psychology and the social sciences is

[1] From the Institute of Child Welfare and the Department of Sociology.

[2] (a) Warren, Richard and Mendenhall, Robert M.: "The Mendenhall-Warren-Hollerith Correlation Method." Columbia University Statistical Bureau Document. No. I.

(b) Mendenhall, R. M. and Warren, Richard: "Computing Statistical Coefficients From Punched Cards." The Journal of Educational Psychology, January, 1930, pp. 53–62.

directly recorded for single units (persons, objects, phenomena) it would seem both economical and more accurate to punch directly from these raw data units or sheets. The shape in which the raw data are set, i.e., the relative amount of number-symbols which are identical to those on the Hollerith card as against data that must be scored from a code as the card is punched, the general legibility of the raw data sheet, etc., will influence the speed and accuracy with which the card can be punched. The personal factor of fatigue which is influenced by the physical conditions in the laboratory that tend to interfere with or increase the attention and energy of the operator should also be weighed in estimating the time needed to dispatch a job.

A routine check of the punching and verifying processes would provide evidence as to the relationship of output to time. Such evidence would have a definite value for the administration of the laboratory. The dispatch of any single investigation that includes a large quantity of data would be materially benefited if routine checking is initiated from the beginning.

The tables and graphs show an analysis of direct card punching from raw data sheets to 80-column Hollerith cards for a research population of 15,000—a study of unmarried mothers and their children. The raw data sheet (4 by 11 inches) contains information concerning the child, the mother, the alleged father and the foster parents. There are 93 categories of information; therefore the maximum number of spaces to be punched for any one case is 93, exclusive of the serial number. In 74 of the categories the data are scored from a code of 563 possible items; in 19, the data consists of numerals that are identical with those on the Hollerith card.

Habituation to the code and increasing familiarity with the process of punching and verifying results in a typical learning curve as shown in figure 1.

From figure 2, it appears that the operators had attained a plateau in production. For thirteen successive days the punch operator dispatched on an average 219 cards a day, 33 per hour; the operator at the verifying machine dispatched on an average 256 cards a day, 39 per hour; the average number of errors per

day was 17, 2.5 per hour. No analysis of the concentration of errors per cards was made. If the errors distributed themselves at the rate of one per card, our present figures would predict 1000 errors in about 1,500,000 items which if distributed according to chance would not seriously influence any single item.

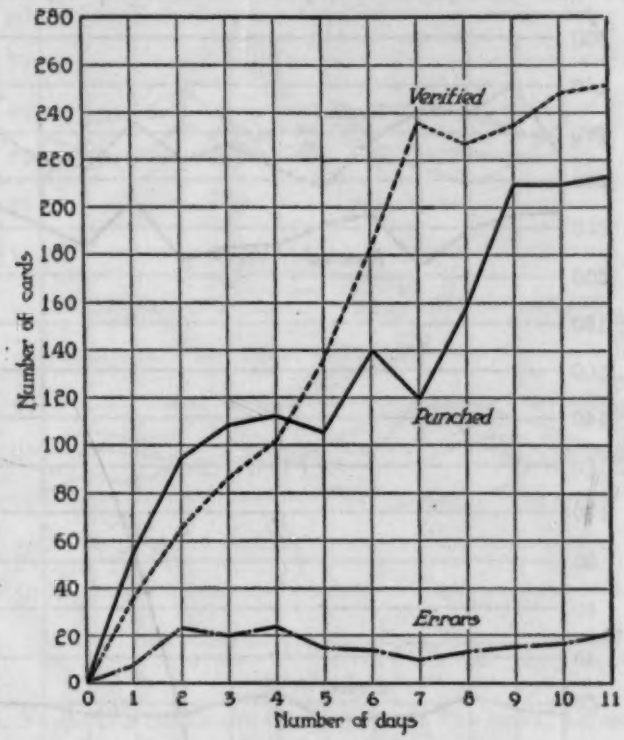


FIG. 1. NUMBER OF HOLLERITH CARDS PUNCHED AND VERIFIED AND THE NUMBER OF ERRORS FIRST ELEVEN DAYS

An analysis of production in relationship to period of the day, (figs. 3 and 4), revealed a distinct advantage for the morning periods. The day was broken up as follows: Period I, 8:45 a.m. to 10:15 a.m.; Rest, 10:16 a.m. to 10:24 a.m.; Period II, 10:25 a.m. to 11:55 a.m.; Lunch; Period III, 1:00

p.m. to 2:50 p.m.; Rest, 2:51 p.m. to 2:59 p.m.; Period IV, 3:00 p.m. to 4:50 p.m.

The superiority in output for card punching is period II, followed successively by periods I, III and IV. The output drops from 37.38 per hour in period II to 30.13 in period IV.

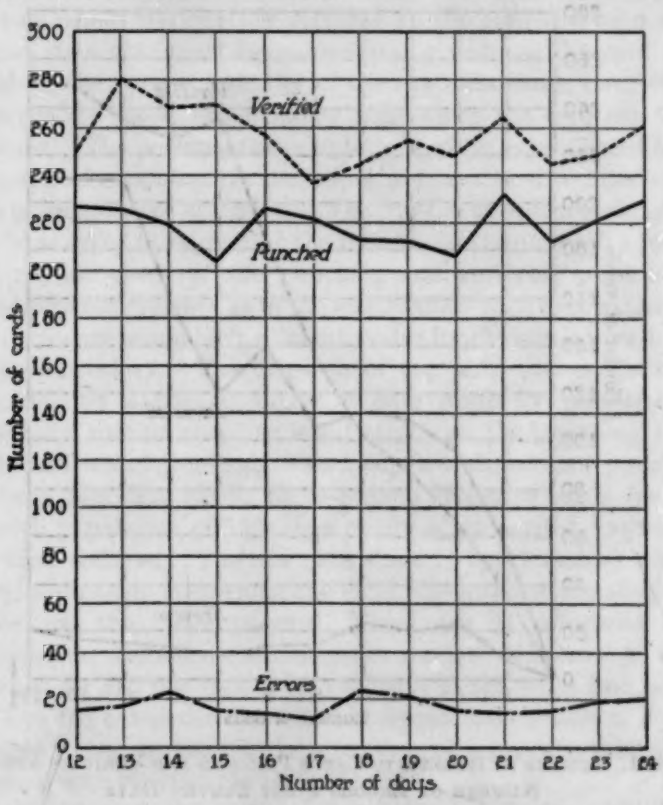


FIG. 2. NUMBER OF HOLLERITH CARDS PUNCHED AND VERIFIED AND NUMBER OF ERRORS FOR 13 SUCCESSIVE DAYS

In card verifying the rank in superiority for output is: I, II, III, IV. The drop is from 42.31 per hour in period 1 to 33.87 in IV. This observation revealed no "end-spurt," commonly found in piece work machine operations. In general, it con-

forms to the fatigue curve known to exist in non-piece work operations.

The analysis of the number of errors, table 1, in relationship to the period of the day showed that in period IV, the errors

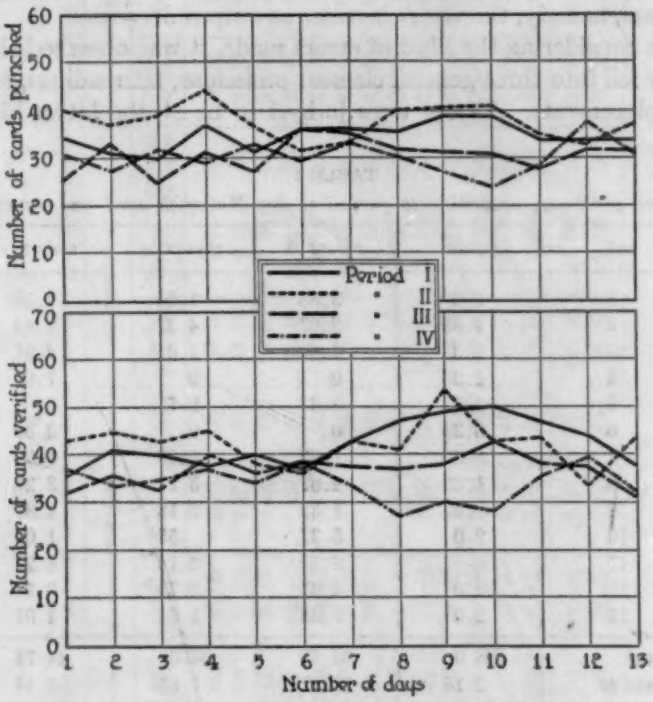


FIG. 3. NUMBER OF HOLLERITH CARDS PUNCHED PER HOUR, ACCORDING TO PERIOD OF DAY

FIG. 4. NUMBER OF HOLLERITH CARDS VERIFIED PER HOUR, ACCORDING TO PERIOD OF DAY

increased 60 per cent over period I, 22 per cent over period II and 86 per cent over period III. Apparently the drop in quality of work is very abrupt when fatigue sets in.

The percentage of errors in relationship to the total number of cards punched per hour and period of day, table 2, increased in

period IV; namely, 83 per cent over period I and 37.5 per cent over period II, and 83 per cent over period III. The period of lowest output was the period of the greatest per cent of errors. This observation is in agreement with Pieraccini's[3] on typesetters, namely, the errors increase as output decreases.

In considering the kind of errors made, it was observed that they fell into three general classes: omissions, misreadings, and misplacements. Errors were judged to be of the latter kind

TABLE 1

*Errors per hour, according to period of day Hollerith card was punched*

| DAY | PERIOD I | PERIOD II | PERIOD III | PERIOD IV |
|---|---|---|---|---|
| 1 | 2.0 | 3.33 | 1.64 | 2.18 |
| 2 | 1.33 | 2.67 | 4.37 | 1.64 |
| 3 | 3.33 | 4.00 | 1.64 | 4.91 |
| 4 | 1.33 | 0 | 0 | 7.09 |
| 5 | 2.67 | 3.33 | 2.73 | 0 |
| 6 | 3.33 | 0 | 0 | 3.82 |
| 7 | 6.00 | .67 | 1.09 | 6.00 |
| 8 | 1.33 | 4.67 | 3.27 | 3.27 |
| 9 | .67 | 1.33 | 2.18 | 4.37 |
| 10 | 2.0 | 5.33 | .55 | 1.09 |
| 11 | 0 | 3.33 | 2.18 | 3.27 |
| 12 | 2.0 | 4.67 | 2.73 | 2.18 |
| 13 | 2.0 | 3.33 | 1.64 | 4.91 |
| Total..... | 28.0 | 36.67 | 24.00 | 44.74 |
| Average..... | 2.15 | 2.82 | 1.85 | 3.44 |

when the correct space was punched in a column directly to the left or right of the column in which it should have appeared. This kind of error is clear cut in a series of columns for which there is no information and spacing is the agreed indicator. In the first check-up misplacements were 1 in every 7 errors, in the succeeding thirteen days they were reduced to 1 in every 24. An analysis of the concentration of errors per card in relation-

[3] Goldmark, Josephine: "Fatigue and Efficiency." The Russell Sage Foundation, 1912 (see pp. 133–138).

TABLE 2

*Per cent of errors according to total number of cards punched per hour and period of day*

| DAY | PERIOD I | | | PERIOD II | | | PERIOD III | | | PERIOD IV | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cards punched | Errors | Per cent of errors | Cards punched | Errors | Per cent of errors | Cards punched | Errors | Per cent of errors | Cards punched | Errors | Per cent of errors |
| 1 | 34.00 | 2.00 | .06 | 40.00 | 3.33 | .08 | 25.10 | 1.64 | .07 | 30.55 | 2.18 | .07 |
| 2 | 30.67 | 1.33 | .04 | 37.33 | 2.67 | .07 | 32.73 | 4.37 | .13 | 27.28 | 1.64 | .06 |
| 3 | 30.00 | 3.33 | .11 | 38.67 | 4.00 | .10 | 24.55 | 1.64 | .07 | 31.64 | 4.91 | .16 |
| 4 | 36.67 | 1.33 | .04 | 44.00 | .00 | .00 | 31.10 | .00 | .00 | 29.46 | 7.09 | .24 |
| 5 | 31.33 | 2.67 | .09 | 36.67 | 3.33 | .09 | 27.28 | 2.73 | .10 | 32.73 | .00 | 0 |
| 6 | 36.00 | 3.33 | .09 | 31.33 | .00 | .00 | 36.01 | .00 | 0 | 29.46 | 3.82 | .13 |
| 7 | 36.00 | 6.00 | .17 | 33.33 | .67 | .02 | 35.46 | 1.09 | .03 | 33.28 | 6.00 | .18 |
| 8 | 35.33 | 1.33 | .04 | 40.00 | 4.67 | .12 | 31.64 | 3.27 | .10 | 30.01 | 3.27 | .11 |
| 9 | 38.67 | .67 | .02 | 40.00 | 1.33 | .03 | 31.10 | 2.18 | .07 | 27.28 | 4.37 | .16 |
| 10 | 38.67 | 2.00 | .05 | 40.67 | 5.33 | .13 | 30.55 | .55 | .02 | 24.00 | 1.09 | .05 |
| 11 | 34.00 | .00 | .00 | 34.00 | 3.33 | .10 | 27.82 | 2.18 | .08 | 27.82 | 3.27 | .12 |
| 12 | 34.00 | 2.00 | .06 | 32.67 | 4.67 | .14 | 31.64 | 2.73 | .09 | 37.10 | 2.18 | .06 |
| 13 | 34.00 | 2.00 | .06 | 37.33 | 3.33 | .09 | 31.10 | 1.64 | .05 | 31.10 | 4.91 | .16 |
| Totals.... | 449.34 | 28.00 | .06 | 486.00 | 36.67 | .08 | 396.08 | 24.00 | .06 | 391.71 | 44.74 | .11 |
| Average.. | 34.56 | 2.15 | .06 | 37.38 | 2.82 | .08 | 30.47 | 1.85 | .06 | 30.13 | 3.44 | .11 |

ship to the kind of errors would show the relative seriousness of misplacements. An initial misplacement may be followed by a subsequent misplacement in a complementary direction which would obviously reduce the total number of errors per card, but a single misplacement may throw off every subsequent column. Misplacements are seemingly a matter of accuracy in audition to the click of the machine; the pointer to the left of the key board, which is the guide for columns, demands turning the head and according to the operators is resorted to only

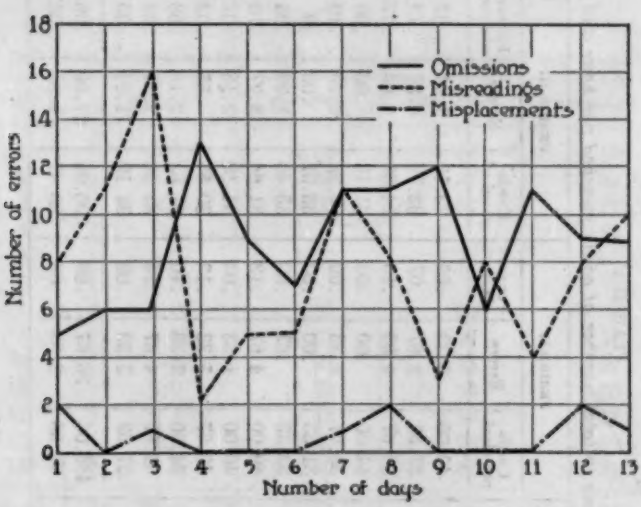


FIG. 5. ERRORS OVER 13-DAY PERIOD ACCORDING TO KIND, OMISSIONS, MISPLACEMENTS AND MISREADINGS

in a long series of spacing. Omissions averaged 8.85 per day in the thirteen day check-up. This number, it would seem could be considerably reduced by an investigation of the lighting in the laboratory, an analysis of the items omitted and attention to the vividness of the ink used on the raw data sheet.

During the thirteen-day observation period the verifying process was carried out directly alongside the punching process. According to the statements of both operators the punch operator invariably slowed up when the verifying machine indicated

that an error had been made. The punch operator's first impulse was to want to know the nature of the error and although she soon restrained her desire to interrogate the verifying operator, she could not ignore the fact that an error had been registered against her. How much the volume of card punching was affected by this situation cannot be accurately stated. Factors, other than proximity may explain the increased output, when the two processes were performed at a distance which prohibited any awareness on the part of the punch operator that errors had been made. Over a six-day period, the punch operator averaged 40 cards per hour as against 33 per hour when working adjacent to the verifier; the verifying operator averaged 42 as against 39. This excess of 4 per hour for the punch operator can in all probability be assigned to the factor of proximity to the judgment of her performance. Further, it is interesting to note that errors decreased from 1 in every 13 cards punched to 1 in every 18 when the processes were performed separately.

## SUMMARY

1. The learning of the punching and verifying processes of the Hollerith equipment demonstrate a typical learning curve.

2. Checking the punching process of Hollerith cards from raw data sheets provides an estimate of the time needed to prepare the material for the tabulating machine.

3. Verifying the punched cards reveals the extent of errors. This knowledge is essential in determining the degree of accuracy attained versus the standard of accuracy set. Analysis of the kind of errors and attention to their cause tends to reduce them.

4. The afternoon should be divided into relatively short work periods, preferably three or four with rest periods of three to eight minutes intervening.

5. Verifying within the range of the punch operators' powers of observation implies criticism and therefore tends to impede attention to the task at hand.

# AN APTITUDE TEST FOR HIGH SCHOOL TEACHERS

NANCY CASTLEMAN, MARGARET GROVER AND HERBERT MOORE

*Mount Holyoke College*

## NEED AND PURPOSE

Every year a fairly large per cent of graduates of Mount Holyoke College take up teaching as a vocation. The following indicates the percentage of graduates who have gone into teaching in the last three years.

| *Year* | *Number of class* |
|---|---|
| 1927 | 23.9 |
| 1928 | 15.5 |
| 1929 | 15.9 |

The college employment bureau obtains adequate records of the academic work of prospective teachers but has no basis on which to determine their personality equipment. This lack of an objective measurement of personality traits essential to a teacher is not peculiar to Mount Holyoke College but is a widespread need. This study, in response to this need, aims to provide a practical and objective method of measuring aptitude for teaching. The form chosen is the situation- alternative type. The entire test consists of fifty situations with three solutions for each situation.

## CONSTRUCTION OF TEST

In order to determine what traits to incorporate in the test the following Inquiry was given to a group of successful teachers in South Hadley Falls High School, South Hadley Centre and Woodlawn Schools. The purpose of this Inquiry was to obtain the judgment of experienced teachers on those traits essential for success.

*Inquiry*

To determine what traits and qualities a successful teacher must have. Score as follows: A—Necessary; B—Not necessary but desirable. Underline those which from your own personal experience you consider indispensable.

1. Executive ability
2. Tact
3. Patience
4. Tolerance
5. Accuracy
6. Self-confidence
7. Adaptability
8. Initiative
9. Interest in children
10. Resourcefulness
11. Self-control
12. Enthusiasm
13. Neatness
14. Emotional stability
15. Discretion
16. Ease of expression
17. Up-to-dateness
18. Refinement
19. Promptness
20. Sense of humor
21. Understanding of children
22. Ability to convince others
23. Poise
24. Quickness of perception
25. Industry
26. Persistence
27. Reliability
28. Originality
29. Assurance
30. System
31. Aggressiveness
32. Cheerfulness
33. Ability to discipline
34. Motivation of work
35. Ability to create respect
36. Freedom from impulsiveness
37. Freedom from irascibility
38. Skill in stimulating thought

Add any traits not listed which are involved in dealing with parents, special behavior problems, or teaching in general. Score these additions in same way as above.

As most of the traits were considered by the teachers as "necessary," only those which were considered indispensable were included. These were arranged in order of merit according to the rank position given them by the different teachers. To this list were added the following traits which were suggested by the teachers as further prerequisites necessary for a successful teacher; ability to coöperate, responsive to criticism, and sympathetic attitude. Using the results of this Inquiry and general reading as a basis, twenty-nine situations with three solutions for each were compiled. These were submitted to members of the Psychology and Education Departments at Mount Holyoke College as well as to the Academic Dean and the Head of

the Employment Bureau for criticism and recommendations. They were also given to a number of High School teachers at Pittsfield with the request that besides checking the situations according to the following directions they give constructive criticism.

"*Directions:* These situations represent possible or actual school experiences. Check the answer in each case which represents your natural method of dealing with the situation."

On the basis of these suggestions the twenty-nine situations were revised and thirty-one new situations added. The latter were criticized again by the professors and instructors above mentioned.

Further revision was made and copies of the completed test of fifty situations were given to teachers in the Central High School, and Commercial High School in Springfield, the Holyoke High School, and the South Hadley Falls High School. In all four High Schools the principals were asked to select the five best teachers in the school so that there would be a basis for comparison of the results with those of the average teachers.

The following samples will indicate the nature of the situations:

10. You are aware of a very violent crush between Mary, a shy sensitive girl and Jean, a boisterous, emotional girl. Jean is getting Mary to do her work, and Mary is being ridiculed by Jean's friends for her submissiveness. You would:
   a. Talk to Mary and Jean and give specific recommendations.
   b. Discuss the situation with their parents and have them interest the girls in other groups.
   c. Give a talk to the class on emotional and intellectual independence.

14. The sophomore class has students of widely differing ability taking the same curriculum requirements. A classification on the basis of ability is desirable and possible. The principal opposes intelligence testing. You would:
   a. Give one to your class, and indicate its differential possibilities.
   b. Recommend a psychologist speaker for the Parent-teachers Association.

| ORDER OF MERIT OF RESULTS OF INQUIRY | | PERCENTAGE OF TIMES TRAIT FOUND IN TEST | |
|---|---|---|---|
| Number of times trait was chosen | Trait | Trait | Percentage of times in test |
| 33 | Ability to discipline | Ability to discipline | 20 |
| 32 | Understanding of children | Method | 18 |
| 31 | Patience | Understanding of children | 10 |
| | Interest in children | Motivation of work | 10 |
| 25 | Tact | Coöperation | 10 |
| 23 | Enthusiasm | Tact | 4 |
| 22 | Self-control | Up-to-dateness | 4 |
| 21 | Ability to create respect | Interest in children | 4 |
| | Skill in stimulating thought | Adaptability | 4 |
| 20 | Motivation of work | Ability to create respect | 4 |
| 18 | Self-confidence | Self-confidence | 4 |
| | Reliability | Discretion | 2 |
| 15 | Initiative | Sense of humor | 2 |
| | Cheerfulness | Self-control | 2 |
| 14 | Refinement | Enthusiasm | 2 |
| | Promptness | | 100 |
| | Originality | | |
| 13 | Up-to-dateness | | |
| | Adaptability | | |
| 12 | Sense of humor | | |
| 11 | Accuracy | | |
| | Industry | | |
| | System | | |
| 10 | Tolerance | | |
| 8 | Executive ability | | |
| | Resourcefulness | | |
| | Neatness | | |
| | Persistence | | |
| 7 | Emotional stability | | |
| | Discretion | | |
| | Quickness of perception | | |
| | Freedom from irascibility | | |
| 5 | Ease of expression | | |
| | Poise | | |
| 4 | Freedom from impulsiveness | | |
| 3 | Ability to convince others | | |
| 2 | Aggressiveness | | |
| | Assurance | | |

c. Acquaint yourself with the use of Intelligence Tests in High Schools, and give your information at a Faculty meeting.

15. Miss Brown receives an anonymous letter that the boys in her class have been betting on foot-ball games. She should:

a. Ignore the whole situation until more adequate evidence is available.

b. Advise the class of the information which the faculty have but that nothing is to be done if they are assured that the betting will cease.

c. Call for a show-down.

23. Miss Mason has just started teaching in R— High School. The second day of school general disorder and giggling prevail. She should:

a. Suppress the disorder and demand quiet work.

b. Appeal to the sympathy of the class, and ask for their co-operation.

c. Humiliate one of the main offenders and continue with the class work.

Each situation primarily measures one trait; in general the traits considered of the most importance in the teachers' judgments are represented most often in the given situations, e.g. ability to discipline was regarded as one of the most essential by the teachers, and is represented in twenty per cent of the situations in the test; whereas those appearing less frequently occur less often in the situations. The above table indicates the relative position given the different traits.

## METHOD OF SCORING

The results from the 104 teachers were tabulated, and on the basis of the number of times a solution was checked, a scoring system was devised which made the total possible score for the test 169; the individual scores ranged from plus five to minus five.

*Summary of results from 104 experienced teachers*

| CLASS | NUMBER | RANGE | MEDIAN |
|---|---|---|---|
| Successful teachers | 20 | 75–129 | 98 |
| Average teachers | 84 | 56–124 | 86 |

*Distribution of scores among the two groups of teachers in percentage terms, with a step interval of 5*

| INTERVAL | BEST TEACHERS | AVERAGE TEACHERS |
|---|---|---|
| | *per cent* | *per cent* |
| 125–129 | 5 | 6 |
| 120–124 | 5 | 1 |
| 115–119 | 5 | 4 |
| 110–114 | 5 | 6 |
| 105–109 | 10 | 5 |
| 100–104 | 15 | 8 |
| 95–99 | 20 | 8 |
| 90–94 | | 19 |
| 85–89 | 15 | 14 |
| 80–84 | 5 | 11 |
| 75–79 | 10 | 2 |
| 70–74 | 5 | 0 |
| 65–69 | | 6 |
| 60–64 | | 4 |
| –59 | | 6 |

## VALUE OF TEST

Although the recognition of individual differences is admitted, it is believed that the situations represent actual experiences. Although no specific situation should be taken as a conclusive evidence of the possession or lack of any one trait, a high score on the test seems to indicate the possession of those personality traits which promise success as a teacher.

# EFFECTIVENESS OF VARIOUS RATES OF SILENT READING OF COLLEGE STUDENTS

EDWARD B. GREENE[1]

*University of Michigan*

One of the questions which continually confronts a serious student is "How fast shall I read this assignment?" Various rates are recommended in books on how to study, some advising a rapid first reading followed by a slow perusal of certain parts, others a slow reading followed by more swift repetitions. All suggest that technical material and information which is new must be read more slowly than non-technical and familiar material. It is also pointed out that the method of reading should depend upon the desired results. In some courses numbers of books must be rapidly reviewed while in other courses a single text or manual must be thoroughly memorized. Most courses demand a thorough knowledge of certain "fundamentals" which may be gleaned from skimming some references and reading others intensively.

The factors producing successful results in these situations are certainly very numerous and complex. They may for convenience be classified under the following headings:

1. The degree of visual acuity and endurance.
2. The speed of reading responses.
3. The recognition of symbols, such as letters, numbers, punctuation marks, etc.
4. The association of meanings with certain symbols.
5. The eduction of relations of similarity, difference, cause, etc.
6. The energy factors, such as dominant trains of thought, mood, desire, muscular tension, etc., which direct attention.

It is evident that all of these factors effect complex reading processes, but it is well nigh impossible to measure these factors

[1] This study was aided by a grant from the University of Michigan Research Fund.

separately even under highly controlled conditions. The present study attempts to find the result of varying the second factor, speed of responses, while keeping the others fairly constant.

## I. THE PLAN OF THIS STUDY

Four technical psychological topics each bound in a single booklet were presented at one week intervals to six different groups of college students, a total of 514, under varying conditions. In each case the presentation was followed immediately by an itemized test. From one to four weeks later the identical tests were repeated. The students did not anticipate the retest. At the end of the series the students gave an estimate of the relative complexity and novelty of the topics and of their interest and effort in each reading period. The topics were selected to fit into the program of an elementary psychology course. Topic 1 was an article by H. E. Jones (4) called "Phenomenal Memorizing as a Special Ability." Topics 2 and 3 by the writer, were called "Physiological Aspects of Emotions," and "Transfer of Training," and Topic 4 was from an article by Hunter (9), "Auditory Sensitivity of the White Rat." Each Topic consisted of approximately 2500 words, which included an introduction of about 500 words, an account of experimental procedures of 1600 words, and a summary of 400 words. They were printed in eight point type each making an eight page booklet.

Group I was given the tests before reading the topic, in order to ascertain the score distribution prior to studying the material for a control group. Group II was directed to read the booklet once as fast as possible. Group III was directed to read very slowly and to take careful notes; the notes were collected and scored according to a fairly reliable scale, Greene (7, p 507). Group IV was directed to read very slowly without taking any notes whatever, and Groups V and VI were instructed to read the whole booklet through as fast as possible as many times as possible in the time allowed without notes. Groups III, IV, V and VI were allowed just twenty-five minutes for their reading,

and this was immediately followed by the itemized test. Group VII was given a forty-five minute period in which to answer the test questions by direct comparison with the booklet. All the retests were given on the same day, one week after the last reading period. All the groups read the topics in their numerical order.

In order to measure the speed of reading, the passage of one minute intervals was announced by number. Students were asked to mark the number of each interval in the margin opposite the line where they happened to be reading. The effect of having students mark time intervals has not been carefully measured in this connection, but fifty-two students reported verbally on their reactions. Sixty per cent of them stated that the knowledge of the passage of time kept them alert and working harder than they usually worked on such material. Four percent reported a serious annoyance which increased as the time progressed. The rest of the students stated that the marking of time intervals became so automatic after the first three minutes that their reading was scarcely interrupted. A further study of this distraction would be very valuable.

This plan of study was to some extent dictated by the group situation and the short time allowances. It can not give us the optimum rate of reading for any particular student on this kind of material, nor does it absolutely measure the order of reading and the number of repetitions. Within certain limits, however, it should show fairly clearly any marked superiority of one average rate of reading as compared to another.

### II. THE ABILITY OF THE GROUPS COMPARED

The ability of the groups compared may be partly gauged from Table 1 which shows the number, sex, class in college, scholastic average, and Iowa Reading Test scores. It will be seen that all except Group VI showed no significant differences in any of these measures. Group VI had a larger proportion of men, showed a whole year of advancement in college and stood higher in school work and reading ability. Group VI was composed of students in an advanced psychology course while all

the other groups were from elementary psychology sections. Group VI seems to the writer to be a little more sophisticated and less willing to cooperate than the other groups, and their own estimates shown in Table 3 tend to confirm this observation.

TABLE 1

*Ability of the compared groups*

| GROUP | NUMBER | SEX | | CLASS IN COLLEGE | | | SCHOOL AVERAGE | | IOWA READING | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Male | Female | Sophomore | Junior | Senior | Average | P.E. | Average | P.E. |
| | | *per cent* | *per cent* | *per cent* | *per cent* | *per cent* | | | | |
| I | 70 | 62 | 38 | 61 | 38 | 1 | 1.24 | ±.032 | 124 | ±2.5 |
| II | 65 | 64 | 36 | 60 | 38 | 2 | 1.26 | ±.038 | 110 | ±2.4 |
| III | 83 | 65 | 35 | 57 | 42 | 2 | 1.23 | ±.032 | 116 | ±2.2 |
| IV | 76 | 67 | 33 | 60 | 38 | 2 | 1.20 | ±.025 | 112 | ±2.4 |
| V | 86 | 64 | 36 | 62 | 35 | 3 | 1.16 | ±.035 | 123 | ±2.3 |
| VI | 71 | 73 | 37 | 4 | 59 | 37 | 1.38 | ±.038 | 135 | ±2.3 |
| VII | 63 | 58 | 42 | 57 | 43 | 0 | 1.23 | ±.036 | 122 | ±2.6 |

*Note:* The Scholastic Average is obtained by dividing the student's honor points by the number of hours of enrollment. Honor points are earned as follows: A, three points; B, two points; C, one point, and a grade of D or E, no points. Thus a student who had taken 30 hours of work and gained 40 honor points would have an average of 40/30 or 1.33. The figures given above are averages for the whole group.

*Note:* The Iowa Reading Test (8) was given allowing only two-thirds of the regular time allowances, since it was found that about 60 per cent of these groups finished before the regular time limits.

### III. THE DIFFICULTY OF THE TOPICS AND TESTS

The difficulty of the topics has been appraised by four methods as shown in table 2, commonness of words, estimates of complexity and novelty, and tests results. This table shows that there was no marked relationship between commonness of words and complexity of the total topic, although there is a tendency to rate the most "uncommon" topic, Topic 2 as the most complex. It is interesting to note that all groups of students and the instructors, agreed fairly closely on the relative

complexity of the topics. Just how well these ratings of novelty correspond to the actual novelty is not known. A careful preliminary test would be necessary to evaluate this factor. It seems fairly safe to assume that all the groups except Group VI were nearly equal in previous knowledge because of their similar selection and their ratings. Group VI, however, admitted more familiarity with the material and represented a

TABLE 2

*Relative difficulty of topics*

| TITLE OF TOPIC | UNCOMMON WORDS | STUDENTS' ESTIMATE | | INSTRUCTORS' ESTIMATE—COMPLEXITY | AVERAGE SCORE ON IMMEDIATE TEST |
|---|---|---|---|---|---|
| | | Novelty | Complexity | | |
| | *per cent* | | | | |
| 1. Phenomenal Memorizing | 8.2 | 7.97 ±1.86 | 4.6 ±1.67 | 3.2 | 26.4 |
| 2. Physiological Aspects of Emotions | 12.3 | 5.67 ±1.80 | 7.3 ±1.81 | 7.2 | 26.5 |
| 3. Transfer of Training | 4.1 | 5.77 ±1.79 | 6.9 ±1.81 | 5.4 | 27.3 |
| 4. Audition of White Rat | 9.2 | 7.45 ±1.92 | 5.5 ±1.76 | 4.1 | 28.2 |

*Note:* The uncommon words are those not found in the 10,000 commonest words, Teachers Word Book (11).

The students' estimates of novelty and complexity were indicated on a rating scale from 0 to 10, where 5 was designated as average and 10 the highest. These figures represent the average of Groups III, IV, V, and VI.

The instructors' estimates are the average of eight instructors who kindly acted as judges. They all reported great difficulty in making such judgments, and asked that they be considered as tentative.

more advanced group of students. This probably does account for their slight superiority in some of the test results.

A negative relationship between novelty and complexity is very clearly shown in table 2 for those topics which are high in novelty are also low in complexity. This probably means that the average students rated the new topics as less complex than more familiar topics. No scientific analysis of intrinsic com-

plexity has been applied to this material, and students' ratings are usually considered to be very unreliable. Ratings have been included here because they show group tendencies with considerable uniformity.

The complexity of the topics does not necessarily correspond to the difficulty of the tests designed to cover these topics, and we have no evidence on this point. However, in uncommonness of words the tests were very similar to their respective topics. All the tests were similarly constructed, each consisting of fifty true-false items which averaged nearly seventeen words apiece. Of the fifty items, thirty-five were designed to measure direct recall of information given in the topic, and fifteen to measure inferences from the data presented. Actually a trial group of forty-two students were not able to distinguish all the rote from the reasoning items, but certain items were uniformly classified. It is hoped to discuss these results more fully in another paper.

The difficulty of the tests might be estimated from the immediate tests scores if we could evaluate the effect of practice. There is a slight tendency to increase the average number right as the experiment progresses, but this tendency is small and not very consistent. The absolute effect of practice can only be measured by a future experiment which will rotate the order of presentation with equated groups.

The reliability of the tests has been indicated by the correlation of scores between odd-even items. These range between .45 and .76 using the Pearson product-moment formula, and they are raised to .62 and .86 by applying the Brown-Spearman prophecy formula. In general we may conclude that we have here as reliable a fifty item test as may be expected from this type of material, Wood (12), Ruch (10).

The True-false test was used in preference to other types because it allows for greater range of questions, it is immune from subjective scoring errors, it seems to be as reliable per unit of time as any other type of test, Wood (12), and it generally correlates highly with other itemized types of tests. A battery of several types of tests would have been preferable, but in the time

available it seemed advisable to use one type. The time limit was fifteen minutes, which allowed about 97 per cent of the students to finish the test without rushing. The average completion time was approximately 9 minutes.

An attempt was made to eliminate some of the tendency to answer the tests by chance by having each student indicate his degree of sureness in each answer. This was accomplished by having two columns, one for sure and one for doubtful answers, and by advising students to omit those items which would be purely guess-work. Those papers, about one-half of one per cent, which marked all answers sure or all answers doubtful were discarded on the hypothesis that directions were not being followed. The results of such confidence ratings have been discussed elsewhere. For similar material see Greene (7), and West (13).

## IV. RESULTS

Figure 1 shows the average speed of reading which was maintained by each group on each topic. The differences are fairly large and reliable between all groups except V and VI where the directions were identical. In general Group III while taking notes proceeded at the rate of 104 words per minute, Group IV reading slowly without notes at 122 words per minute. Groups V and VI which were told to read as fast as possible with as many repetitions as time permitted averaged about 180 words per minute, and Group II, which read the articles through only once at maximum speed, 212 per minute. The various fluctuations in average rates are not easy to explain from any available data. The slow reading groups, III and IV, tended on the whole to read more slowly on each succeeding topic, while the fast reading groups tend to increase their rates on the second topic and then to decrease on the third and fourth topics. Group V is unique in showing its fastest rate for topic three.

While the differences between the mean speeds of reading are large enough to be very reliable, the total distributions show some overlapping between the slow and fast groups. Some of those who were directed to read slowly actually read faster

than the mean of the faster reading groups; this number never exceeded 6 per cent of Group III and 20 per cent of Group IV. Among the fast readers about 2 per cent of Groups V and VI read more slowly than the average of Group IV.

In a few cases students failed to finish one complete reading of the topic in the twenty-five minutes allowed. These amounted to about 6 per cent of Group III and 2 per cent of Group IV on each topic. The students who failed to complete one topic generally finished all the other topics. That this was a chance failure is indicated by the fact that the distribution of scores on the Iowa Reading Tests of students who did not finish a topic was practically the same as the scores of those students who did

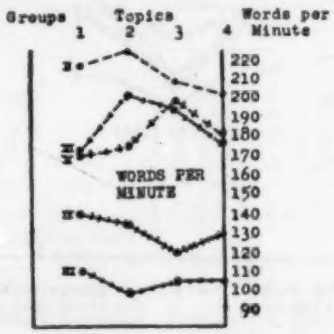


FIG. 1. SPEED OF READING

finish reading all the topics. However, in order to eliminate from the results those failures which were the result of lack of presentation, the records of students who did not finish reading a topic were dropped.

Another important question is, how much did students vary in their speed of reading from one topic to the next. A tabulation was made to show an individual's average deviation from his mean reading rate. The absolute deviations average nearly twelve words per minute for the slow reading groups, and twenty-three words per minute for the fast readers, but the relative deviations are practically the same for all groups, about twelve per cent. About 30 per cent of students were

found in each group who varied their rate of reading less than eight per cent of their total rate during the whole four topics. These individual differences in variation of rate deserve a more thorough future investigation.

Figure 2 shows the total number of right answers for immediate and delayed tests, and also the amounts forgotten. It

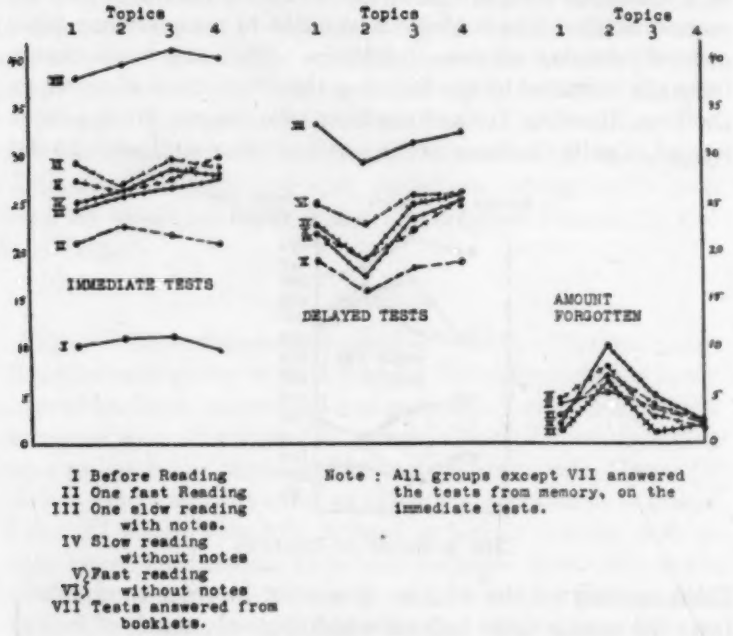
Topics
1 2 3 4
IMMEDIATE TESTS
DELAYED TESTS
AMOUNT FORGOTTEN
I Before Reading
II One fast Reading
III One slow reading with notes.
IV Slow reading without notes
V Fast reading
VI without notes
VII Tests answered from booklets.
Note : All groups except VII answered the tests from memory, on the immediate tests.

FIG. 2. IMMEDIATE AND DELAYED SCORES ON TESTS OF TECHNICAL READING

Seven groups of students, average scores

appears from the differences between Group I and the other groups that the chance factors in the test construction have been fairly well avoided. Group II which had one fast reading which averaged 11.8 minutes is reliably below all the groups which had a 25 minute period for reading. They in turn are far below Group VII which had the whole forty-five minutes

for comparing the booklet and the test sheet. From the point of view of efficiency of learning there is not one whole chance in a thousand that the average student will retain as much from the procedure of Groups III, IV, V, or VI as from Groups VII's procedure (Garrett (6, p. 89)).

Group III which took notes has the lowest immediate and delayed scores and shows as much forgetting as any other group. This seems to indicate that the mere writing of notes with no later review is a distraction and a slight handicap to

TABLE 3

*Average interest and effort of students as shown by ratings of groups III, IV, V, and VI*

| TITLE OF TOPIC | AVERAGE RATING OF EACH GROUP | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Interest | | | | Effort | | | |
| | Group III | Group IV | Group V | Group VI | Group III | Group IV | Group V | Group VI |
| 1. Phenomenal Memorizing..... | 8.6 | 8.3 | 8.3 | 8.2 | 7.1 | 7.0 | 6.2 | 6.4 |
| 2. Physiological Aspects of Emotions..... | 5.1 | 4.8 | 4.7 | 4.2 | 6.1 | 5.8 | 5.2 | 5.4 |
| 3. Transfer of Training..... | 6.5 | 6.2 | 4.6 | 4.6 | 6.6 | 5.9 | 6.0 | 6.0 |
| 4. Audition of White Rat..... | 7.3 | 7.2 | 7.1 | 4.0 | 7.3 | 7.0 | 6.6 | 5.1 |

*Note:* The students' estimates of interest and effort were indicated on a scale from 0 to 10 where 5 was designated as average and 10 as the highest.

most students. The large majority of these students took a No. 8 grade of note as shown by the scale used in grading them. Greene (7, p. 556). This indicates a detailed, fairly accurate outline of the topic containing about 275 words. There was a correlation of .08 between test scores and grade of notes taken.

There are only small differences between the slow readers, Group IV, which did not take notes, and Groups V and VI which read about 50 per cent faster. For the most part these differences are not as large as their own sigmas. Group VI was usually slightly ahead on both the immediate and delayed tests,

but there is a notable exception in the case of Topic 4. Remembering that Group VI was superior to the other groups in both reading scores and scholastic standing, it is not hard to explain their slight superiority in these tests. This failure on Topic 4 corresponds directly with a lack of interest and effort which they reported. This is shown in table 3.

These results indicate that there was no consistent advantage in either the slow or the fast method of reading as carried on in this study. On the average the process of one slow reading seems to be just as effective and no more effective than two fast readings. The total amount of time spent is the important variable. A tabulation of the per cent of Group IV and V succeeding on each item has not brought to light any significant trends. There are about four items on each test where each group exceeds the other by a fairly reliable difference, but the reasons for these differences are not apparent. Each group exceeds in approximately the same proportion of rote and logical items. Similar rates of reading seem to call different parts of the topic to the attention of different persons.

The average decreases in the scores from the immediate to the delayed tests correspond fairly well to the historic curve of forgetting shown by Jones (5), Austin (1) and Bean (3) for similar sorts of material, with the exception of the results for Topic 1. Although this topic had the longest delayed interval, four weeks, still it shows only as much loss as the one week interval. This unusual recall for Topic 1 is probably due to partly to its priority in the series and partly due to its "interest" factor. Table 3 shows that all groups rated this topic as the most interesting by fairly reliable amounts.

Table 3 shows the average interest and effort of each group of students as indicated by their ratings at the end of the series. It is shown that interest and effort agree with each other and with novelty (table 1) and vary inversely with complexity as estimated by the same students. With two exceptions the differences between group averages are considerably less than their own sigmas. One exception is found where the slow reading groups rated the third topic more interesting than the fast

reading groups. The other exception is seen where Group VI found the last topic, "Audition in the White Rat," relatively uninteresting, while the other groups rated it second in interest and first in effort. The immediate and delayed test scores of Group VI on Topic 4 are below what would have been predicted on the basis of their other performances. Measures of interest seem to be an important aspect of investigations of reading. Bassett (2) found similar results in the retention of historical information.

In order to investigate further the effect of speed of reading on test scores, correlations were found between these as shown in

TABLE 4

*Correlation between speed of reading and success on tests*

| | | GROUP III | GROUP IV | GROUP V | GROUP VI | COMBINED GROUPS IV AND V |
|---|---|---|---|---|---|---|
| Immediate Tests | 1... | .20 ± .08 | .05 ± .06 | .07 ± .08 | .01 ± .07 | .10 ± .05 |
| | 2... | .05 ± .06 | .02 ± .07 | .04 ± .07 | .06 ± .08 | .04 ± .05 |
| | 3... | .02 ± .07 | .08 ± .08 | .00 ± .07 | .04 ± .08 | .01 ± .05 |
| | 4... | .07 ± .07 | .03 ± .08 | .08 ± .07 | .05 ± .07 | .06 ± .05 |
| Delayed Tests | 1... | .22 ± .06 | .07 ± .09 | .04 ± .06 | .06 ± .06 | .12 ± .05 |
| | 2... | .09 ± .07 | .05 ± .07 | .12 ± .07 | .09 ± .08 | .09 ± .08 |
| | 3... | .01 ± .08 | .03 ± .06 | .06 ± .07 | .04 ± .06 | .04 ± .06 |
| | 4... | .06 ± .07 | .05 ± .07 | .04 ± .06 | .03 ± .07 | .05 ± .05 |

table 4. In order to allow for the widest range in rate, Group IV which read slowly was combined with Group V which read much faster. These correlations are all of a very low order, indicating practically a chance relationship between the rate of reading and success on the tests. These figures, of course, do not show anything about the optimum speed for any particular person. A very important field of study lies in the investigation of optimum personal rates.

## SUMMARY AND CONCLUSIONS

1. In an attempt to measure the relative effectiveness of various rates of reading, four technical psychological topics

were presented in booklet form to six different fairly equal groups of college students with 75 persons in a group. Fairly reliable itemized tests were given immediately after the reading periods and the same tests were repeated one week after the last reading period. At this time the students also rated the topics on an arbitrary ten point scale for novelty, complexity, interest and effort.

2. The results show that Group 1, students who took the tests before reading the booklets, averaged about 10 correct items out of 50. Group 2, which read the booklet once fast, averaged about 212 words per minute and scored approximately 22 items correct. Four other groups each had twenty-five minutes for reading. One of these, Group 3, read slowly, 105 words per minute, took rather detailed notes, and scored about 27 items correct. Group 4 read at 132 words per minute and scored about 28 items correct. Group 5 averaged 180 words per minute and scored about 28.5 points, and Group 6 reading at the rate of 187 words per minute averaged 29 items correct. Group 7 was given forty-five minutes to answer the test with the booklet in hand. Their rate of reading was not measured but they scored about 40 items correct. The rate of reading was indicated by having each student mark one minute intervals by number in the margin of the booklet where he happened to be reading at the time the number was announced.

3. These figures indicate that the amount of time seems to be much more important than the rate of reading. This conclusion is confirmed by the correlation coefficients between rate of reading and success on the tests which are all approximately of a chance order. Those taking notes seemed to be slightly handicapped by them in both the immediate and delayed tests. There was a chance correlation between the completeness of notes and test scores. Their notes were collected and scored according to a reliable scale, but not returned to the students until after the delayed tests.

4. The ratings for interest, effort, and novelty show a rather high group consistency and also concur with each other to a marked degree. They vary inversely with ratings of complex-

ity of the topic, which also show uniform group averages. The first topic was rated as most interesting by all groups and the last topic second in interest, by all groups except number 6. Group 6 shows the results of this lack of interest in both immediate and delayed test scores. While such ratings are far from reliable they indicate the urgent necessity for evaluating interest factors in test situations such as these.

5. The curve of forgetting is unusual in that the first topic was retained much better than would be predicted by the general curve of forgetting from the other topics. This is probably due to its position in the series and to the greater interest evoked.

## REFERENCES

(1) Austin, S. D. McK.: A Study of Logical Memory. Am. J. of Psych., 1921, 32, 370–403.

(2) Bassett, S. J.: Retention of History in the Sixth, Seventh, and Eighth Grades, with Special Reference to the Factors that Influence Retention. J. of Ed. Psysh., 1929, xx, no. 9, 683–691.

(3) Bean, C. H.: Curve of Forgetting. Archives of Psych., 1911, no. 21.

(4) Jones, H. E.: Phenomenal Memorizing as a Special Ability. J. of Applied Psych., 1926, x, 367–376.

(5) Jones, H. E.: Experimental Studies in College Teaching. Archives of Psych., 1922, No. 68.

(6) Garrett, H. E.: Statistics in Psychology and Education. 1926. Longmans.

(7) Greene, E. B.: Relative Effectiveness of Lecture and Individual Reading as Methods of College Teaching. Gen. Psych. Monographs, 1928, iv, No. 6.

(8) Greene, H. A., and Jorgensen, D. N.: Iowa Silent Reading Tests, 1928. Univ. of Iowa Publications.

(9) Hunter, W. S.: Auditory Sensitivity of the White Rat. J. of Animal Behavior, 1914, iv, No. 3, 215–222.

(10) Ruch, G. M.: Improvement of the Written Examination. Scott Foresman 1924.

(11) Thorndike, E. L.: Teachers Word Book, Teachers College Publications 1921.

(12) Wood, E. P.: Improving the Validity of College Achievement Tests. J. of Ed. Psych., 1927, 18–26.

(13) West, P. W.: A Critical Study of Right-Wrong Method. J. of Ed. Research, viii, 1923, p. 1–9.

## NOTES AND NEWS

Through the coöperation of the British Psychological Society and the Training College Association a new journal, *British Journal of Educational Psychology*, has been inaugurated. This new Journal will incorporate the earlier *Forum of Education*. It will be edited by C. W. Valentine, University of Birmingham in February, June and November of each year. The subscription in this country will be $4.75 per year. Those interested may address the Managing Editor, *British Journal of Educational Psychology*, the University, Edmund Street, Birmingham.

The Southern Society of Philosophy and Psychology, the Ohio Academy of Science, the Ohio College Association, and the second annual gathering to discuss the teaching of the social sciences at Northwestern all convened on the same dates, April 2, 3, and 4. The editor of this JOURNAL urges those psychologists and others interested to get together and arrange the dates of these meetings so that there will be fewer conflicts. It might be found that some of these could be merged so that fewer meetings would suffice.

The Mid-Western Psychological Association this year will hold its annual meeting in Chicago May 8 and 9 under the presidency of Professor L. L. Thurstone.

The joint meetings of the Ohio Academy of Science with the Indiana and Kentucky Academies held at Miami University April 2, 3, 4 proved to be a very successful and interesting conference. This JOURNAL would report particularly for Section E, Psychology to the effect that many of those present expressed a desire to have such joint conferences more often in the future.

Twenty-eight different methods by which high schools of the United States recognize and adapt their programs to special needs of individual students were reported to the United States Office of Education in reply to 23,000 questionnaires sent to American high school principals in connection with the Office of Education's National Survey of Secondary Education. Preliminary findings were submitted to School Life, official organ of the Office, by Dr. Roy O. Billett, school administration specialist of the National Survey. Twenty per cent or more of the larger schools (enrollment over 1,000) use 18 of the 28 provisions originally

tabulated on the Office of Education questionnaire. Smaller schools were found to be less able than the larger ones to adapt their programs to the different needs of students.

"Both large and small schools use problem method, project curriculum, out-of-school projects, special coaching of slow pupils, individualized instruction, and laboratory plan of instruction with about equal success," Dr. Billett points out, although be stresses the fact that advisory programs, educational and vocational guidance through exploratory courses, opportunity rooms for slow pupils, scientific study of problem cases, psychological studies, and ability grouping are used in large schools with far greater frequency and reported success than in small schools.

Individualized instruction seems equally applicable in schools of any size, special coaching of slow pupils is practiced in more than half of the schools of any size, and successful use of scientific study of problem cases increases as enrollment increases in the high school.

A Swedish translation of "Sleep" by Donald A. Laird is being published by Bokförlaget Natur och Kultur of Stockholm. The same publishers issued a translation of "Increasing Personal Efficiency" by the same author in 1927. The firm of Joseph Singer of Berlin has just issued a German translation of "Increasing Personal Efficiency."

The Stanford University Press announces the publication of a new test for certain aspects of personality, prepared by Robert G. Bernreuter and entitled The Personality Inventory. This test combines the measurement of four traits: Neurosis, Self-sufficiency, Introversion-extroversion and Dominance-submission. The reliabilities of the separate scales range from .85 to .92. The correlations between each scale and previously published measures of the same traits range from .76 to .94. When corrected for attenuation each of these values becomes .97 or higher. The test is suited for use with either sex; norms are being prepared for both high school and college students and for adults. The time required for administration to a group of college students is usually less than 25 minutes.

More than 800 American medical students attempted to enter a single medical school in Scotland during 1930. Five thousand more medical school applicants were reported in 1929–30 than in 1926–27. Last year 66 approved four-year schools graduated as many physicians as were graduated by twice as many schools 20 years ago. The typical medical school graduate in this country is 25 years old. He completes a four-year course, and generally supplements his medical school training with a one-year interneship in an approved hospital before going into practice. With one doctor to every 800 persons the United States has more

physicians than any other representative country. In 1930 medical schools graduated only 204 women. The average number of women graduates per year since 1925 has been 205. Declines in the percentage of women graduates have been reported since 1926, however.

Dr. Willard C. Rappleye was director of study of the Commission on Medical Education which was organized in 1925 by the Association of American Medical Colleges to study the medical situation in the United States. Much of the information and statistics gathered is incorporated in the medical education chapter of the Biennial Survey of Education in the United States, 1928–30, which may be purchased from the Superintendent of Documents, Washington, D. C., for five cents.

The fourth biennial convention of the World Federation of Education Associations, July 27 to August 2 will be held in Denver, Colorado. The attendance probably will run well into the thousands. The homeward trek of teachers attending the N. E. A. convention at Los Angeles will be interrupted at Denver by this second great convention of the summer. The World Federation of Education Associations came into existence in San Francisco in 1923. Foreign educators who had rather skeptically answered the American invitation to join in making preliminary plans for the association were heard to comment, "This is an international conference after all."

Out of this beginning grew the biennial convention at Edinburgh in 1925; Toronto in 1927; Geneva in 1929; Denver in 1931. This in brief tells the story of the World Federation of Educational Associations.

The organization of the association into international committees reveals, however, an amazing story of effort in attaining the following objectives: "Friendship, justice, and good will among the nations of the World;" "Tolerance of the rights of all nations;" "Appreciation of the value of inherited gifts of nations and races."

The association includes the following departmental organizations: the Parent-Teacher Association, health education, educational crafts, preparation of teachers, international aspects of library service, education and the press, rural life and rural education, pre-school and kindergarten, elementary education, secondary education, the international aspect of colleges and universities.

Dr. Augustus C. Thomas, Augusta, Maine, is president of the World Federation of Education Associations, and Dr. Charles H. Williams, University of Missouri, Columbia, Missouri, is secretary.

# BOOK REVIEWS

EDWARD L. THORNDIKE. *Human Learning*. The Century Co., New York, February 2, 1931. 206 pp.

This is Professor Thorndike's latest book and should prove especially interesting to laymen in that it is a non-technical discussion of certain facts and principles pertaining to the learning process which the author has brought together during many years of investigation in the fields of both human and animal learning.

The first ten chapters are revised lectures dealing with the nature of human learning. With one fell swoop the author disposes of "adjustments," "configurations," "drives," "integrations," "purposes," "tensions" and the like by saying that "all of these facts seem to me to be reducible so far as concerns their powers to influence the course of thought or feeling or action to *connections* and to *readinesses* in the nervous system. Learning is connecting. The mind is man's connective system." (Page 122).

The physiological basis for this theory is equally simple and, as the author himself admits, highly speculative, as indeed are all physiological theories of learning. Each neurone is supposed to live much as would an amoeba, or any one-celled animal, with all movement or changes of position being restricted to its ends. Since a neurone's life processes consist of receiving and transmitting stimuli, any synaptic bond, the conduction across which produced "annoying states of affairs," would be given up and those maintained which produced "satisfaction." And so we have a restatement of his old hedonistic and association theory of learning, supported, however, by much new experimental data that gives a certain evaluation or weight to his theory. This theory he now restates in the light of this experimental data and the numerous criticisms that have been directed towards it in recent years by Gestalt psychologists and other workers in the field of learning.

The last two chapters of the book are concerned with the evolution of learning and its future possibilities.

"Man does not, so far as we know, have new varieties of neurones or new modes of action of neurones, but he does have many more of them with far greater possibilities of interconnection than exist in other animals." (Page 168). This fact is made the basis for his quantitative theory of learning. This "quantitative difference in associative learning is . . . . the producer of the qualitative differences which we call powers of ideation, analysis, abstract and general notions, inference, and reasoning."

The general outlook presented by the book is optimistic. For as the author puts it "We still have much to learn about eugenics," "but even now we know . . . . that with selective breeding within 100 generations, we could hope to have a race of men whose average would be much nearer to the intellect of Newton, Pasteur, Gladstone, or Edison than to that of the average man of to-day."

Professor Thorndike's discussion of the nature and evolution of man's learning process explains many fundamental facts and principles of human learning in the light of significant experimental data obtained from investigations carried on during the past three years. These principles and facts are explained in clear and simple language that should be understood by all. The book gives the best statement of the author's theory of learning that he has ever made. It does not, however, present a complete account of the learning process. The establishment of new habits or connections by the action of conditioning stimuli is only briefly sketched, and the relation of this fundamental type of improvement to the learning process as a whole is not pointed out.

W. F. Book,
*Indiana University.*

Thomas Russell Garth. *Race Psychology, A study of racial mental differences.* Whittlesey House (McGraw-Hill); New York, 1931. xiv + 260. $2.50.

The reviewer of a book on astronomy in a recent number of *Science* says, "It is one of those rare books that treat a whole field of knowledge from the purely scientific point of view and do not attempt the impossible in catering to the professional astronomer and to the layman at the same time." The present reviewer feels that this is high praise and he regrets that he cannot say it of Professor Garth's *Race Psychology.* It is evident as one reads that this book has been written with the layman in mind. Whole chapters are presented to establish a background which would not be necessary if the book were addressed to psychologists. The experimental literature is non-critically and, in many instances, summarily presented. To the layman the evidence will probably support the thesis of the book that the found differences between races are due to nurture and not nature, (incidentally this is the reviewer's own point of view) but the professional psychologist may feel differently. An example may illustrate why.

On page 83 the author summarizes the discussion of racial differences in intelligence. He says, "Disregarding the I.Q.'s of the immigrant groups, which we do not believe are measures of the average of the groups in their home lands, the racial I.Q.'s as found are, by way of résumé: whites, 100; Chinese, 99; Japanese, 99; Mexicans, 78; southern Negroes, 75; northern Negroes, 85; American Indians, full blood, 70." (Why not disregard Chinese, Japanese and Mexicans as they are also

immigrants?) In spite of differences as large as 30 I.Q. points the author says on page 84, "Differences so far found in the intelligence of races can be easily explained by the influence of nurture and selection," but in no place does he give adequate experimental evidence for this statement.

The division of space among various experimental topics suggests a lack of evaluation. The summary of reports on racial differences in intelligence, of which the author lists over eighty, occupies eighteen pages, while the report on color preferences, with six studies (all by the author or his students), occupies twenty-one pages. Further, five studies of musical talent take nineteen pages and the two investigations on the "community of ideas" are given fourteen pages.

A question that the psychologist is sure to ask is one regarding how completely the literature has been covered. In 1925 and again in 1930 Dr. Garth published reviews of the race psychology literature in the *Psychological Bulletin*. In each he gives tables of the experimental reports. That for 1925 (covering the period from 1916) includes 45 reports, and the one in 1930 has 75, or a total of 120. A similar table in this book includes only 100 studies and it is supposed to include reports since 1881. Furthermore, the author cites the reaction time work of Meyers while on the Cambridge Anthropological Expedition, but does not mention the other studies reported in the same volume, nor does he mention some twenty or more papers there cited. Also in the bibliography of 196 titles (his two reviews include 285) there are only two papers in German, which are not on race studies, and one in French, viz., Levy-Bruhl, *Les fonctions mentales dans les sociétés inférieurs*. Surely the foreign literature has more to offer than that.

Having pointed out what the reviewer believes to be the most serious defects it is only fair that the good qualities of this work be mentioned. For the first time a large part of the experimental literature in the field of racial comparisons has been gathered together and systematically summarized. As a pioneer work it will prove invaluable to the author of a future extensive and critical résumé. The ordinary reader will find here presented a fair picture of the present state of our knowledge on this vitally important subject. Finally, perhaps its greatest value is for the research psychologist who will find the book extremely suggestive of the lines future investigation must take.

JOSEPH K. FOLSOM. *Social Psychology*. Harper & Bros., New York, 1931. xviii + 701 pp. $3.50.

The point of view of a book on social psychology is usually determined largely by the author's primary interest. J. M. Williams' *Principles of social psychology* is evidently the work of a sociologist, while Allport's *Social psychology* is obviously the writing of a psychologist. The present author, who is a sociologist, has made a rather successful attempt to keep a middle course.

In Chapters two and three the author has adequately summarized the current psychology based on the S-R concept with its elaboration through conditioning to habits and attitudes. These organizations of behavior are summarized on a chart which, while it includes most of the elements and their integrations, is almost too complicated for clarity.

The individual's personality is due to the organization of attitudes into wishes. The author elaborates the Park and Burgess classification of wishes into four groups—security, new experiences, recognition and response. These wishes are not always easily satisfied and are frustrated necessitating some readjustment of the personality.

Thus far, that is for six chapters, the emphasis has been on the individual. In Chapter VII we are introduced to the author's concept of social psychology. It is not a mere division of individual psychology as Allport holds, nor is it a study of a group mind as conceived by Le Bon. The definition upon which the argument of the book rests is that social psychology is the "science of the *interaction* of individual behavior." Interaction may be environmentally mediated or behavioristic. Only the latter is subject matter for social psychology. The patterns of behavioristic interaction take four forms; mutual gratification, conflict, accommodation and assimilation. Fundamentally these may all be thought of as interactions of individual wishes. These interactions are guided and controlled by selection, social control, etc., and are ultimately organized into a culture, which in turn plays a part in the further organization.

To the reviewer the most important chapter is that called "Social Psychiatry" in which the practical utility of social psychology is considered. This utility is *not* "to teach the arts of social control" but to teach individuals to adjust more successfully to one another. It can alleviate the conditions which make for mental suffering and thus bring happiness to individuals.

So much for the argument of the book. In make-up and style it is well adapted for a textbook. The brief résumés of experimental literature are a very valuable feature. Likewise the selected bibliography will prove valuable to the student.

C. M. Louttit,
*Ohio University.*

Margaret Wooster Curti. *Child Psychology.* Longmans, Green and Co., 1930.

"This book," says the author in the preface, "is intended to be a comprehensive survey of the psychology of the normal child." The "special periods" as "infancy," "early and middle childhood," "adolescence," etc., have not been directly considered; although, the author says that each of these topics is worthy of a separate volume. The point of view

intended in this work is one of a "unified whole" with regard to normal childhood development. The author presents her material in a general topical way—the discussions falling under such topics as "perceptual—motor learning," "motivation," "thinking." In many ways such as "biological approach," "genetic method," "objectivity in experimental studies reported" and the general topical treatment, one is often reminded of a general psychology published in 1928—namely, Dashiell's *Fundamentals of Objective Psychology*. The book, too, is expressive of a *dynamic functional psychology* which reflects deeply the influence of men like Carr, Allport, Dashiell and others who lean toward this point of view. In all these points, however, it is the reviewer's opinion that the author is to be commended.

Excluding the introductory chapter in which the author briefly sketches methods, aims, theories, past and present of child psychology, the book contains thirteen chapters. Chapters II and III deal with "The Child's Mental Inheritance" and "Physical and Mental Growth" respectively. The former discusses the "mechanisms of inheritance," including the chromosome and gene theories, etc., while the latter takes up "prenatal" and "postnatal" growth and ends with correlation studies between general bodily growth and mental growth as reported by Terman, Woodrow, Baldwin, Buford Johnson, et al.

In regard to "mental inheritance" the author concludes that "no trait is either hereditary or environmental for all children" and that after all either "hereditary" or "environmental" traits are subject to modification. As to the relationship which may exist between physical and mental growth, she brings out the fact that statistical results show little correspondence between anatomical growth and intelligence test scores. Then, too, both mental and physical development depend upon propitious environment—and certainly there is a relationship between physiological changes and emotional stability. Chapter IV deals with "Instinct Theory" and "Native Responses." The author leans toward the Jamesian definition of instinct. However, Watson's conception of an instinct ("a concativation of reflexes") is considered. After critically discussing the different criteria of instincts now extant she concludes the chapter with her own tentative classification of "native responses."

In Chapters V and VI the discussion turns toward learning. These chapters deal with "perceptual-motor learning" and "conditioning." The author has selected pertinent critical experiments on childhood conditioning both from the Russian school and from work done in this country. But being pressed hard for experimental data (no fault of the author's, just meager work along this line) in her perceptual-motor learning discussion she has to incorporate studies made on rats, adults and children like that of Hicks and Carr's. Historically, of course, this study is suggestive but as to the validity of its data there may be

questions raised, for at that time mazes were not standardized—and further one cannot be sure of the sensory value that the situation had for the different subjects used.

While the author's approach to learning is on a sound basis, namely, motivation plus a problematic situation—it seems her acceptance of Carr's theory of "sensory consequences" as adequate to explain the factors of "selection," "elimination," and "fixation" settles the problem a bit too neatly.

Chapter VII is given over to "speech" and "meanings" and "ideas" in children. Quotations from Allport, Gesell, Blanton, Fletcher, Stinchfield, and others are met. Her point concerning speech as that of random articulation with selection and integration of language habits seems acceptable. But the results of experiments reported as Hunter's delayed reaction, Kohler's experiments with apes, and Yerkes' and Hamilton's multiple-choice techniques may not lend themselves, it seems to the writer, so well to her concept of "ideas."

Chapters VIII and IX continue "meaning," "thinking," and "reasonings," etc. These two chapters are full of impirical and nonimpirical discussions of how the child comes to have meaningful responses built up toward self and the world about him. Writers like Dewey, Stern and Piaget are quoted often. While the author discusses "meanings," "reasoning," etc., as resulting from the process of childhood adjustments it often appears that the author is in danger of interpreting these modes of adjustment from an adult viewpoint.

Chapter X considers "motivation" or "why" children learn. After paying her respects to "drives" and "motivation" as Dashiell treats them, she then offers Carr's definition of motivation. The definition reads like this: "A relatively persistent stimulus that dominates the behavior of an individual until he reacts in such a manner that he is no longer affected by it." She includes emotions as a form of motivation. Although she tells us that Dashiell's conceptions of "drive" and "motivation" are too vague, she does not herself offer any explanation of how later external stimuli come to have potency in setting the organism going when in the beginning only "physiological conditions" set himoff. This chapter is replete with definitions of such rubrics as "desire," "purpose," "impulse," "volition," etc., none of which have been given scientific meaning by experimentation. The discussion of substitute devices which arises when "motives" are thwarted smacks strongly of the adult point of view.

Chapter XI deals with play. After giving a number of play theories to which the author cannot subscribe whole heartedly, she offers, along with Taylor, the "Freedom from conflict" definition of play. Her discussion is guided here by studies like Lehman and Witty's on "The Psychology of Play Activities."

Chapters XII and XIII treat juvenile delinquency, its causes and results. The author evidently loses sight of her major purposes, namely, "to give a comprehensive unified picture of normal childhood development" for she goes out of her way to discuss theories of causation as "The Criminal Type," "Moral Imbecile," etc., instead of sticking only to experimental studies of delinquency as they bear on normal childhood.

The last chapter is on personality, what it is, and the techniques used to measure it. As was the case in the treatment of emotions so here we find the author following Allport's conception of personality as it is related to childhood.

Barring the tendency to incorporate useless material in her aim at a comprehensive unity (which to the reviewer means a complete picture of child development and not the incorporation of all theories extant about instincts, play, delinquency, etc.) of childhood development, the author has put together a good book, the point of view of which, the method of approach, and the well selected summary of pertinent experiments furnish good material so that any reader may get a clear conception of what the psychology of childhood is about.

JAMES R. PATRICK,
*Ohio University.*

## NEW BOOKS AND PAMPHLETS*

Books and pamphlets for review should be sent to James P. Porter, Department of Psychology, Ohio University, Athens, Ohio.

*Animal Drive and the Learning Process.* EDWIN B. HOLT. Henry Holt and Company, New York. $2.50. 307 pp.

*Annotated Index of Theses and Dissertations in Education.* FREDERICK J. WEERSING AND BENJAMIN R. HAYNES. University of Southern California School of Education, Los Angeles, California. 91 pp.

*Annual Report of the General Education Board, 1929–30.* General Education Board, 61 Broadway, New York City. 73 pp.

*The Art of Study.* T. H. PEAR. E. P. Dutton and Company, New York City. $1.50. 117 pp.

*Creative Mind.* C. SPEARMAN. D. Appleton & Company, New York City. $2.00. 162 pp.

*Dreams and Personality.* FREDERICK PIERCE. D. Appleton and Company, New York City. 337 pp.

*The Enlargement of Personality.* J. H. DENISON. Charles Scribner's Sons, New York City, 1930. $3.00. 340 pp.

*Essentials of Effective Speaking.* FREDERICK W. ORR. The Macmillan Company, 1931. $1.40. 305 pp.

*Intelligence Testing: Methods and Results.* RUDOLPH PINTNER. Henry Holt and Company, New York City. $2.40. 555 pp.

*Methoden zum Studium der Funktionen der einzelnen Organs des tierischen Organismus,* Vol. 7, No. 7. Urban & Schwarzenberg, 1930. Friedrichstrasse 105, Berlin N 24, Germany.

*Personality, The Crux of Social Intercourse.* A. A. ROBACK. Sci-Art, Publishers, Harvard Square, Cambridge, Mass. $1.25. 144 pp.

*Problems in Business Statistics.* Michigan Business Cases, No. 3, January 1931. University of Michigan, Bureau of Business Research, Ann Arbor, Michigan. $1.00. 45 pp.

*The Psychology of the Elementary School.* HARRY GROVE WHEAT. Silver, Burdett and Company, New York City. $2.00. 440 pp.

*Prince's "Neurogram" Concept: Its Historical Conception.* LYDIARD H. H. HORTON. Bio-Psychology, Bulletin of the Cartesian Research, Philadelphia, Pa. 33 pp.

*Remedial English and Diagnostic Tests.* WALTER S. GUILER AND RALPH L. HENRY. Ginn & Company, New York City. 80 cents. 275 pp.

---

*Mention here does not preclude further comment.

*Restriction of Output Among Unorganized Workers.* STANLEY B. MATHEWSON. The Viking Press, New York City. $3.00. 212 pp.

*Social Psychology.* JOSEPH K. FOLSOM. Harper and Brothers, New York City. $3.50. 701 pp.

*Students Attitudes.* DANIEL KATZ AND FLOYD HENRY ALLPORT. The Craftsman Press, Inc., Syracuse, N. Y. $3.50. 408 pp.

*The Vibratory Sense and Other Lectures.* DAVID KATZ. University Press, Orono, Maine, 1930. 163 pp.

*Vierteljahrsschrift fur Jugendkunde.* VON RUDOLF ALLERS. Julius Klinkhardt, Verlagsbuchhandlung, Leipzig, Germany. 80 pp.

*The Vocabulary of Arithmetic.* G. T. BUSWELL AND LENORE JOHN. University of Chicago, Chicago, Ill. 146 pp.

## Directory of American Psychological Periodicals (*Continued*)

**Psychological Abstracts**—Eno Hall, Princeton, N. J. American Psychological Association. Subscription $6.00. 700 pages ann. Edited by W. S. Hunter. Monthly. Abtracts of psychological literature. Founded 1927.

**Journal of General Psychology**—Worcester, Mass.: Clark University Press. Subscription $7. 500-600 pages annually. Edited by Carl Murchison. Quarterly. Experimental, theoretical, clinical, and historical psychology. Founded 1927.

**Journal of Social Psychology**—Worcester, Mass.: Clark University Press. Subscription $7.00. 500-600 pages annually. Edited by John Dewey and Carl Murchison. Quarterly. Political, racial, and differential psychology. Founded 1929.

**Journal of Personnel Research**—Baltimore: The Williams & Wilkins Co. Subscription $5.00. 500 pages approximately. Edited by Walter V. Bingham, and Clarence S. Yoakem. Bi-Monthly.

**Mental Measurement Monographs**—Baltimore: The Williams & Wilkins Company. Subscription $5. 400 pages annually. Edited by Knight Dunlap and Buford Johnson. Published without fixed dates, each number a single research. Founded 1925.

**Studies in Psychology and Psychiatry**—Baltimore: The Williams & Wilkins Company. Subscription $5. 400 pages annually. Edited by Edward A. Pace. Published without fixed dates, each number a single research. Founded 1926.

**Journal of Philosophy**—New York: 515 West 116th Street. Subscription $4.00. 728 pages per volume. Founded 1904. Bi-weekly. Edited by F. J. E. Woodbridge, Wendell T. Bush, and H. W. Schneider.

**Child Development**—Baltimore, Md.: Williams & Wilkins Company. Subscription $5.00. 400 pages annually. Edited by Buford Johnson. Quarterly. Founded 1930.

## Directory of American Psychological Periodicals

**American Journal of Psychology**—Ithaca, N. Y.; Cornell University. Subscription $6.50. 624 pages annually. Edited by M. F. Washburn, K. M. Dallenbach, M. Bentley, E. G. Boring. Quarterly. General and experimental psychology. Founded 1887.

**Journal of Genetic Psychology and The Pedagogical Seminary**—Worcester, Mass.: Clark University Press. Subscription $7. 600 pages annually. Edited by Carl Murchison. Quarterly. Child behavior, differential and genetic psychology. Founded 1891.

**Psychological Review**—Princeton, N. J.: Psychological Review Company. Subscription $5.50. 540 pages annually. Bi-monthly. General Psychology. Edited by Howard C. Warren. Founded 1894.

**Psychological Monographs**—Princeton, N. J.: Psychological Review Company. Subscription $6.00 per vol. 500 pp. Ed. by Raymond Dodge. Published without fixed dates, each issue one or more researches. Founded 1895.

**Psychological Index**—Princeton, N. J.: Psychological Review Company. Subscription $4.00. 300-400 pp. Edited by W. S. Hunter. An annual bibliography of psychological literature. Founded 1895.

**Psychological Bulletin**—Princeton, N. J.: Psychological Review Company. Subscription $6.00. 720 pages annually. Psychological literature. Monthly. Edited by Edward S. Robinson. Founded 1904.

**Archives of Psychology**—New York: Columbia University. Subscription $6. 500 pp. ann. Ed. by R. S. Woodworth. Published without fixed dates, each number a single experimental study. Founded 1906.

**Journal of Abnormal and Social Psychology**—Eno Hall, Princeton, N. J. American Psychological Association. Subscription $5. Foreign, $5.25. Editor, Henry T. Moore. Quarterly. 448 pages annually. Abnormal and Social. Founded 1906.

**Psychological Clinic**—Philadelphia: Psychological Clinic Press. Subscription $3.00. 288 pages. Ed. by Lightner Witmer. Without fixed dates (9 Numbers). Orthogenics, psychology, hygiene. Founded 1907.

**Psychoanalytic Review**—Washington, D. C.: 3617 10th St., N. W. Subscription $6. 500 pages annually. Psychoanalysis. Quarterly. Ed. by W. A. White and S. E. Jelliffe. Founded 1913.

**Journal of Experimental Psychology**—Princeton, N. J. Psychological Review Company. 500 pages annually. Experimental. Subscription $6.00. Bi-monthly. Edited by S. W. Fernberger. Founded 1916.

**Journal of Applied Psychology**—Baltimore: The Williams & Wilkins Co. Subscription $5.00. 400 pages annually. Bi-monthly. Edited by James P. Porter, Ohio University, Athens, Ohio. Founded 1917.

**Journal of Comparative Psychology**—Baltimore: The Williams & Wilkins Co. Subscription $5.00 per volume of 450 pages. Three volumes every two years. Edited by Knight Dunlap and Robert M. Yerkes. Founded 1921.

**Comparative Psychology Monographs**—Baltimore: Johns Hopkins University Press. Subscription $5. 400 pages per volume. Knight Dunlap, Managing Editor. Published without fixed dates, each number a single research.

**Genetic Psychology Monographs**—Worcester, Mass.: Clark University Press. Subscription $7.00 per volume. Two volumes per year, 600 pages each. Edited by Carl Murchison. Monthly. Each number one complete research. Child behavior, animal behavior and comparative psychology. Founded 1925.

*(Continued on Third Cover)*